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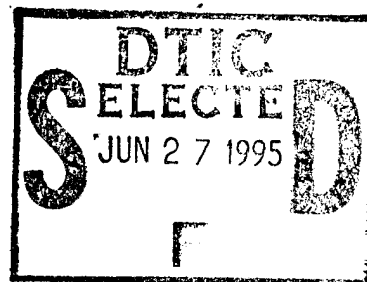


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Current Meter Observations During the Kuroshio Extension Regional Experiment

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13. ABSTRACT (Maximum 200 words) Current velocities and temperatures were measured using an array of current meter moorings (CMMs) deployed along a line across the Japan Trench near 35° N, 143° E, as part of the Kuroshio Extension Regional Experiment (KERE). A total of 15 instruments were distributed among five moorings. The resulting time series data describe deep currents as well as the Kuroshio where it separates from the Japanese Coast. The moorings were deployed from July 1992 through June 1994. This report describes the CMM data.				
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Introduction

Background

Instrument Description

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Codes
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 dial

the ambient magnetic field, respectively. These analog levels are converted to earth coordinates and then digitized and averaged over the sampling interval. Averaged data are then recorded on cassette tape within the instrument housing.

The ACM-II is about 1.5m in length and about 20 cm in diameter, and weighs about 100 lb in air. It is powered by batteries constructed of D-cells (alkaline cells were used for KERE deployments).

Current Meter Data Processing

CM data are internally recorded on cassette tapes. These tapes are normally removed from the instrument at sea. At NRL, data are transferred in hexadecimal format from the tapes to disk files on an IBM-compatible computer (PC) where they are converted to engineering units and ASCII format. These ASCII files are then transferred to a Sun Work Station for further processing and analysis. Each sample in the raw, unedited file consists of 6 variables: time, eastward velocity component (U), northward velocity component (V), temperature (T), pressure (P) and compass (ϕ ; the housing orientation). The U and V components recorded in the instrument are horizontal velocity components relative to magnetic north, hence a variation correction is applied (in the PC step) to convert to true northward and eastward velocity components: for KERE, the magnetic variation is -7° . Pressure sensors were present only in 4 CMs.

The first figure is a map showing the locations of the CMMs as well as the IESs (IESs are not discussed further in this report; see Teague and Hallock, 1995). CMMs B and C were inshore of the Japan Trench, D was on the seaward flank of the Trench and E was on the abyssal plain. The second figure shows the vertical arrangement of the CMs on the moorings. On actual moorings (not shown in the figure) clusters of floats (17" glass spheres protected by fiberglass shrouds) were distributed between the CMs. Large, syntactic foam buoys were placed on the top of each mooring, and parallel (pairs) of acoustic release mechanisms were placed below the deepest CMs.

Filled left/right sides of CM symbols represent complete records for first/second year, respectively. CM designators in the figure are used throughout the report; hence, "CM93D3" represents the second year record from mooring D at depth 3000m, etc. A more complete summary of data recovery appears as Table 1. Notice that records CM92E2 and CM93E1 are quite short. In the first, the recorder failed after about 2 months; in the second, the instrument leaked and failed after about 3.5 months. Also note that 4 of the instruments (year 1) did not yield temperatures; this was due to an internal malfunction in the temperature processing circuitry. Only the upper CM on each mooring had pressure sensors (B1, C1, D1 and E1). CM depths (Table 1) are based on mean pressures from upper instruments and the known cable lengths between instruments. This method of estimating CM depth minimizes errors due to stretch of nylon line placed below releases, and uncertainties in bottom depths.

Tables 2 and 3 list basic statistics of recorded parameters. Table 3 differs from Table 2 only for velocities (U, V); Table 3 is for "offset corrected" velocities (discussed below). An overbar (e.g. \overline{U}) indicates a time average and σ indicates a standard deviation. \overline{S} and $\overline{\theta}$ are the speed and direction of the mean velocity. The relatively large σ_P values for the D1 and E1 records (as well as the large pressure ranges (P_{min} and P_{max}) indicate significant mooring motion as a result of the flow in the thermocline. Analysis shows (not presented here) that direct contamination of velocities by horizontal movements of CMs as a result of mooring motion is minimal. However, the vertical excursions of the D1 and E1 instruments, through the high vertical shear in the thermocline, introduces some spatial aliasing to these records. Correction for this effect is not discussed here. The vertical aliasing due to mooring motion is not important for the remaining, deeper instruments since the vertical shear is much less, as are the vertical excursions of these

CMs.

Most temperature records exhibited bias errors which may be caused by CM internal register malfunctions for most-significant bits. Hence, CTD data were used to provide a constant correction to each record. Standard deviations appear to be acceptable, but further, small adjustments (following this report), based on post-calibration results, will probably be made. \bar{T} for CMs 92B2, 92D2, 92E2 and 92E4 (the instruments which did not yield temperature records) are just the CTD values for those locations (these are indicated by asterisks in Table 2 and 3).

A number of the velocity records exhibited anomalies that suggested zero offsets in instrument coordinates. Scatter plots of U vs V yielded a "donut"-shaped cloud rather than a Gaussian cloud about the mean value. When transformed back into instrument coordinates (using ϕ), the "donut" characteristic was no longer present, and the offset was apparent as the center of the cloud, off the origin. By subtracting weighted averages of instrument-coordinate components from the instantaneous values, an offset correction was effected. The corrected instrument-coordinate components were then transformed back to earth coordinates, and these appear in Table 3. For the offset correction scheme to be valid, two criteria must be met: there must be "adequate" variability of ϕ , and that variability cannot be significantly correlated with the real velocity components. If these criteria are not met, then fictitious calculated offsets may result. Hence, while offset-corrected velocities for all records are presented in this report, as well as the uncorrected velocities (for reference purposes and additional considerations of the problem), in subsequent analyses, offset-corrected data should only be used when the uncorrected data are obviously contaminated (e.g. when a data set shows anomalies such as the "donut" distribution). For the KERE data, offset-corrected velocities should be used for the following records: 92C1, 92C3, 92E4, 93C2, 93C3, 93D3, 93E4.

Tidal and inertial energy are significant components of the variability in all CM data. Since much of subsequent analyses will focus on lower frequencies, it is useful to present the data with the higher frequencies removed. The second set of plots show low-pass filtered velocities, with half-amplitude point at 40 hours.

Data Plots

Plots of all time series appear after Table 3 as follows: U and V components (raw); U and V components (raw; offset-corrected); U and V components (low-pass filtered); U and V components (low-pass filtered; offset corrected); Pressure (P); Temperature (T).

Acknowledgments

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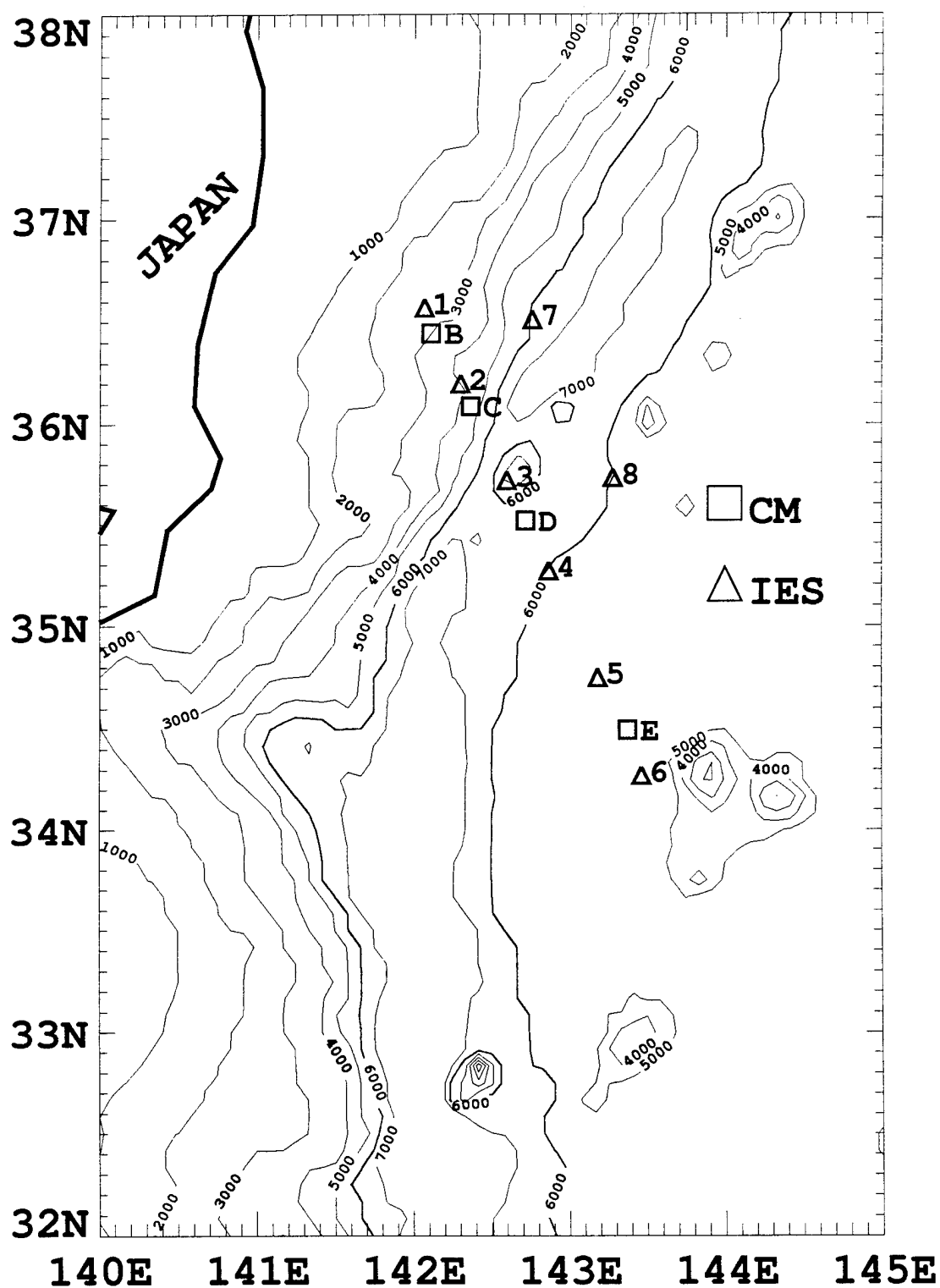
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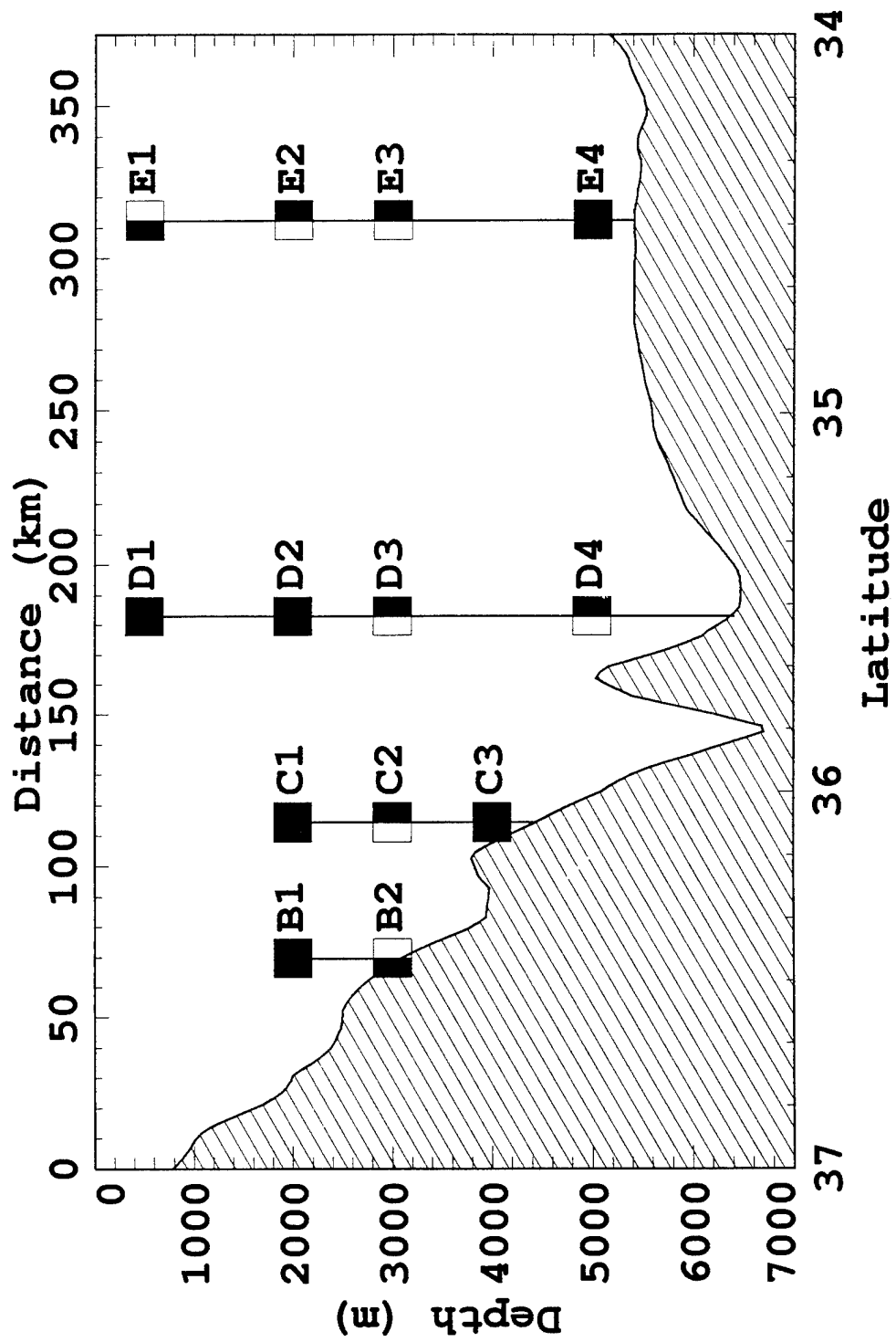


Table 1: CURRENT METER SUMMARY

Meter ID	Start Day	End Day	Lat ° N	Lon ° E	Meter Depth	Bottom Depth	Parameters
CM92B1	193.38	538.00	36.443	142.107	2046	3270	p,t,u,v
CM92B2	193.38	538.00	36.443	142.107	3046	3270	u,v
CM92C1	195.25	539.50	36.083	142.365	2172	4600	p,t,u,v
CM92C3	195.25	539.50	36.083	142.365	4172	4600	t,u,v
CM92D1	196.50	540.75	35.513	142.712	443	6380	p,t,u,v
CM92D2	196.50	540.75	35.513	142.712	1943	6380	u,v
CM92E1	199.25	543.75	34.493	143.378	525	5500	p,t,u,v
CM92E2	199.25	273.00	34.493	143.378	2025	5500	u,v
CM92E4	199.25	543.75	34.493	143.378	5025	5500	u,v
CM93B1	174.25	510.00	36.442	142.110	2017	3270	p,t,u,v
CM93C1	175.50	509.75	36.085	142.367	2156	4600	p,t,u,v
CM93C2	175.50	509.75	36.085	142.367	3156	4600	t,u,v
CM93C3	175.50	509.75	36.085	142.367	4156	4600	t,u,v
CM93D1	177.50	508.88	35.547	142.663	362	6380	p,t,u,v
CM93D2	177.50	508.88	35.547	142.663	1862	6380	t,u,v
CM93D3	177.50	508.88	35.547	142.663	2862	6380	t,u,v
CM93D4	177.50	508.88	35.547	142.663	4862	6380	t,u,v
CM93E1	180.25	285.00	34.493	143.378	530	5500	p,t,u,v
CM93E2	180.25	507.00	34.493	143.378	2030	5500	t,u,v
CM93E3	180.25	507.75	34.493	143.378	3030	5500	t,u,v
CM93E4	180.25	507.75	34.493	143.378	5030	5500	t,u,v

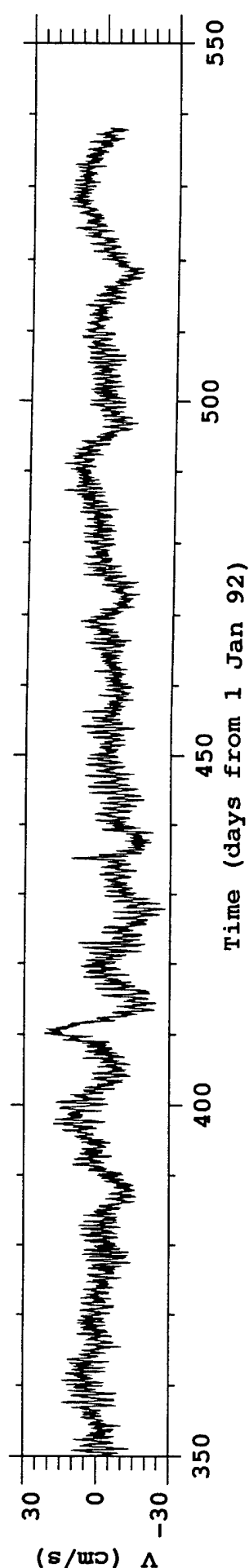
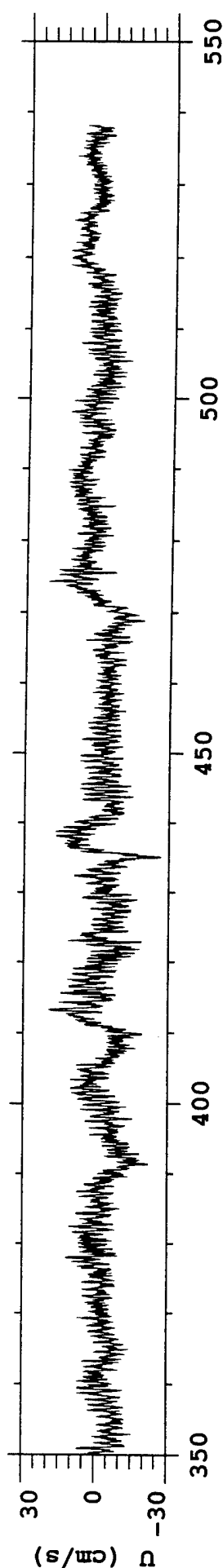
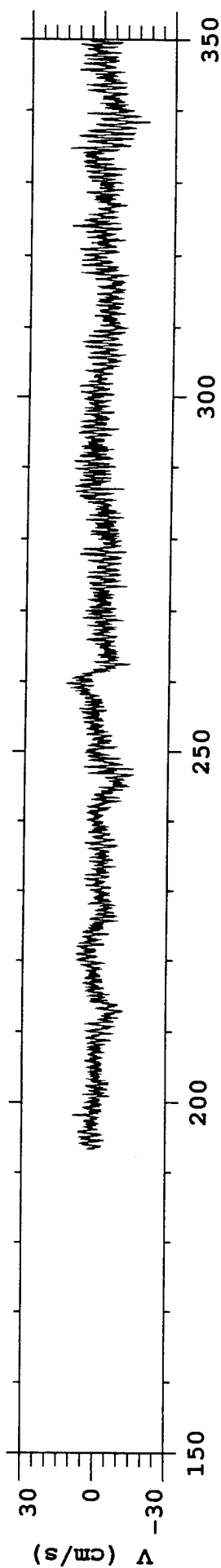
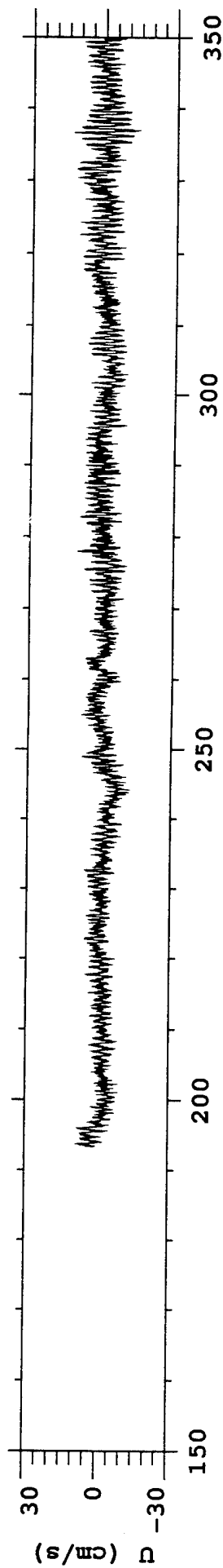
Table 2: CURRENT METER STATISTICS (uncorrected raw data)

Meter ID	U_{min}	U_{max}	\bar{U}	σ_U	V_{min}	V_{max}	\bar{V}	σ_V	\bar{S}	$\bar{\theta}$	T_{min}	T_{max}	\bar{T}	σ_T	P_{min}	P_{max}	\bar{P}	σ_P
CM92B1	-26.4	19.1	-1.0	5.0	-27.8	21.4	-1.6	5.9	1.9	212	1.78	2.13	1.88	0.05	2034	2073	2046	2.4
CM92B2	-25.3	18.6	-0.3	6.0	-21.0	23.5	-0.5	6.0	0.6	206			1.32*					
CM92C1	-22.8	25.1	1.1	6.7	-31.7	21.6	-2.9	7.5	3.1	160	1.66	1.96	1.80	0.04	2158	2228	2172	7.5
CM92C3	-20.9	22.6	-1.6	9.4	-30.4	22.6	-6.3	9.3	6.5	194	1.42	1.48	1.45	0.01				
CM92D1	-27.2	79.7	33.7	16.9	-42.8	77.0	10.2	15.4	35.2	73	4.15	17.17	10.27	3.03	408	776	443	38.3
CM92D2	-14.1	35.9	8.9	6.3	-21.6	27.5	3.6	6.9	9.6	68			2.39*					
CM92E1	-49.9	72.6	14.8	17.7	-62.2	58.7	-0.3	16.0	14.9	91	3.28	15.80	13.24	1.59	513	641	525	15.4
CM92E2	-10.3	11.6	1.0	3.5	-12.6	12.4	0.0	3.8	1.0	91			2.18*					
CM92E4	-17.5	24.8	3.7	7.3	-39.8	25.6	-2.0	10.9	4.2	119			1.52*					
CM93B1	-24.8	17.4	-0.6	4.4	-20.6	14.4	-1.3	4.8	1.4	204	1.80	2.01	1.88	0.03	2015	2031	2017	1.0
CM93C1	-13.8	17.4	-0.3	3.2	-15.9	12.6	-0.8	3.3	0.9	201	1.69	1.91	1.80	0.03	2141	2210	2156	6.4
CM93C2	-20.6	20.3	-4.0	9.1	-25.4	22.0	-3.3	9.9	5.2	230	1.48	1.56	1.52	0.01				
CM93C3	-9.4	19.4	0.8	2.9	-26.6	11.2	-3.2	4.4	3.3	166	1.42	1.48	1.45	0.01				
CM93D1	-49.9	93.1	27.3	25.8	-48.5	66.9	4.4	15.9	27.6	81	4.45	18.13	10.16	2.46	323	651	362	54
CM93D2	-17.2	31.3	5.9	6.5	-27.1	32.0	3.5	7.7	6.9	60	2.26	2.57	2.39	0.05				
CM93D3	-19.3	22.9	3.6	5.5	-16.1	23.3	7.3	6.1	8.2	26	1.61	1.78	1.67	0.02				
CM93D4	-20.0	19.2	-2.1	5.5	-7.2	13.7	2.4	3.2	3.2	318	1.49	1.53	1.51	0.01				
CM93E1	-51.9	69.2	25.1	21.2	-72.4	67.4	6.6	30.9	26.0	75	5.56	14.56	11.37	2.02	481	700	530	43
CM93E2	-13.1	29.2	3.6	4.8	-25.2	22.2	-1.0	5.5	3.7	105	2.04	2.39	2.18	0.06				
CM93E3	-12.1	21.2	2.9	4.2	-21.3	12.6	-1.5	5.3	3.3	117	1.59	1.71	1.65	0.02				
CM93E4	-14.5	27.8	2.4	5.7	-31.7	10.9	-7.6	5.7	8.0	162	1.51	1.54	1.52	0.01				

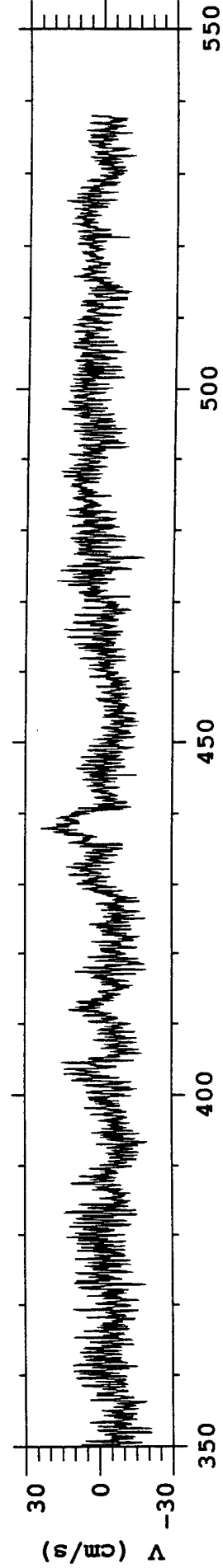
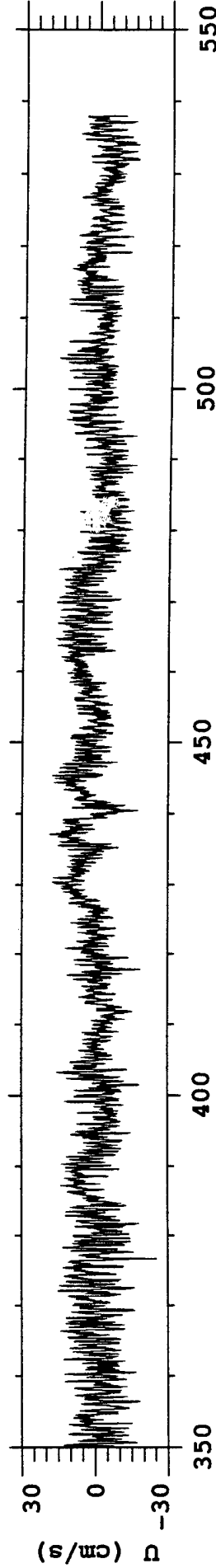
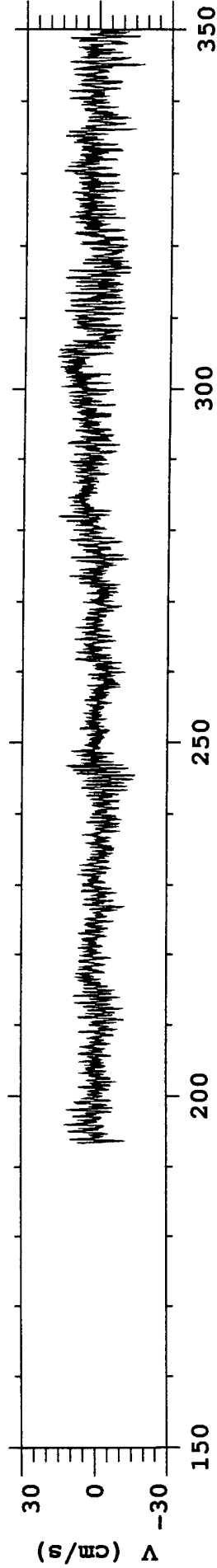
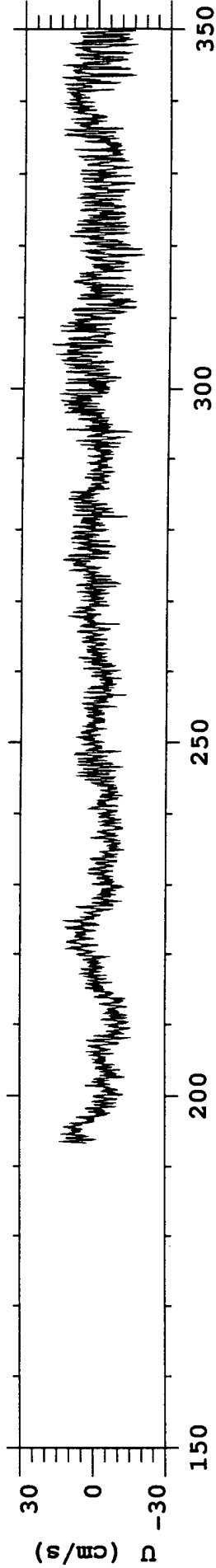
Table 3: CURRENT METER STATISTICS (offset-corrected raw data)

Meter ID	U_{min}	U_{max}	\bar{U}	σ_U	V_{min}	V_{max}	\bar{V}	σ_V	\bar{S}	$\bar{\theta}$	T_{min}	T_{max}	\bar{T}	σ_T	P_{min}	P_{max}	\bar{P}	σ_P
CM92B1	-23.1	16.4	-0.6	3.8	-24.6	18.7	-1.4	4.5	1.5	203	1.78	2.13	1.88	0.05	2034	2073	2046	2.4
CM92B2	-20.8	19.0	-1.2	5.5	-19.6	19.6	-0.4	4.6	1.3	250			1.32*					
CM92C1	-16.6	19.0	0.6	3.5	-25.1	16.8	-1.0	4.3	1.2	149	1.66	1.96	1.80	0.04	2158	2228	2172	7.5
CM92C3	-22.4	27.2	-0.2	4.4	-23.9	28.7	-2.0	4.4	2.0	185	1.42	1.48	1.45	0.01				
CM92D1	-26.2	73.6	28.8	16.4	-36.4	70.6	9.5	13.1	30.3	72	4.15	17.17	10.27	3.03	408	776	443	38.3
CM92D2	-17.3	27.1	1.8	5.6	-21.9	21.9	0.5	4.8	1.9	74			2.39*					
CM92E1	-44.8	67.0	12.7	15.5	-57.7	53.6	-1.2	13.6	12.7	95	3.28	15.80	13.24	1.59	513	641	525	15.4
CM92E2	-9.7	10.8	0.7	3.3	-13.3	11.1	-0.7	3.6	1.0	134			2.18*					
CM92E4	-18.5	17.1	0.0	3.8	-34.7	20.5	-4.2	7.1	4.2	180			1.52*					
CM93B1	-21.9	15.1	-0.5	2.9	-16.9	11.1	-0.7	3.1	0.9	214	1.80	2.01	1.88	0.03	2015	2031	2017	1.0
CM93C1	-13.8	17.7	-0.2	3.0	-16.4	12.1	-0.8	3.2	0.8	194	1.69	1.91	1.80	0.03	2141	2210	2156	6.4
CM93C2	-22.9	26.7	-1.5	4.1	-24.4	25.3	-1.4	4.5	2.0	226	1.48	1.56	1.52	0.01				
CM93C3	-8.1	17.2	0.1	2.4	-25.1	9.2	-2.6	3.7	2.6	177	1.42	1.48	1.45	0.01				
CM93D1	-48.7	92.7	26.8	25.4	-50.4	65.2	2.6	15.8	26.9	84	4.45	18.13	10.16	2.46	323	651	362	54
CM93D2	-18.2	31.9	6.1	6.7	-25.5	33.7	4.6	7.9	7.6	53	2.26	2.57	2.39	0.05				
CM93D3	-17.0	20.2	3.1	4.3	-13.3	19.0	4.2	4.5	5.2	37	1.61	1.78	1.67	0.02				
CM93D4	-23.2	22.3	-0.2	5.9	-10.2	14.3	.4	3.4	2.4	356	1.49	1.53	1.51	0.01				
CM93E1	-44.1	66.6	21.7	18.2	-66.5	59.7	5.8	26.0	22.5	75	5.56	14.56	11.37	2.02	481	700	530	43
CM93E2	-14.7	30.0	2.3	5.0	-24.6	19.8	-2.5	5.2	3.4	137	2.04	2.39	2.18	0.06				
CM93E3	-15.9	23.0	2.0	4.9	-24.0	10.0	-4.0	4.9	4.5	153	1.59	1.71	1.65	0.02				
CM93E4	-10.5	26.4	2.8	5.0	-27.5	14.9	-4.6	6.0	5.4	149	1.51	1.54	1.52	0.01				

cm92b1

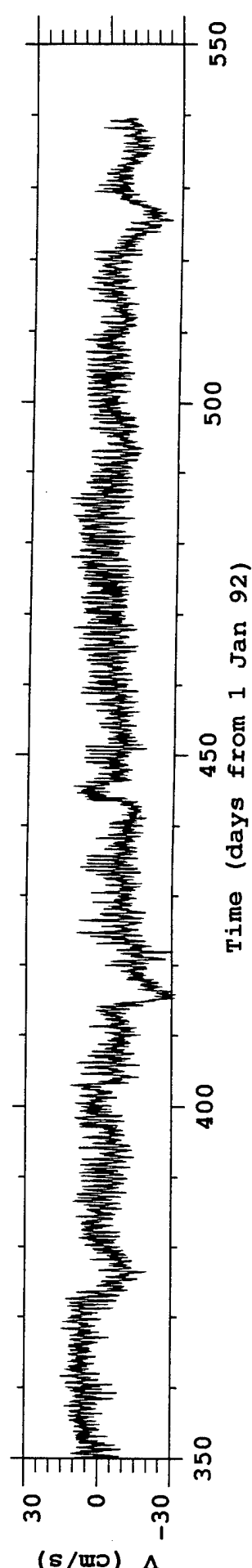
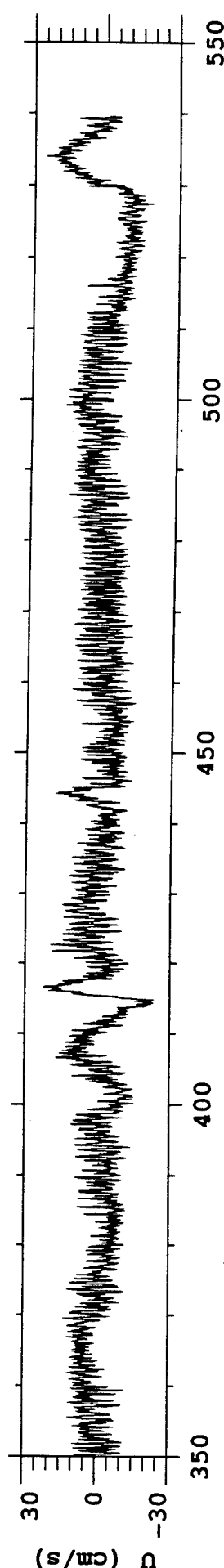
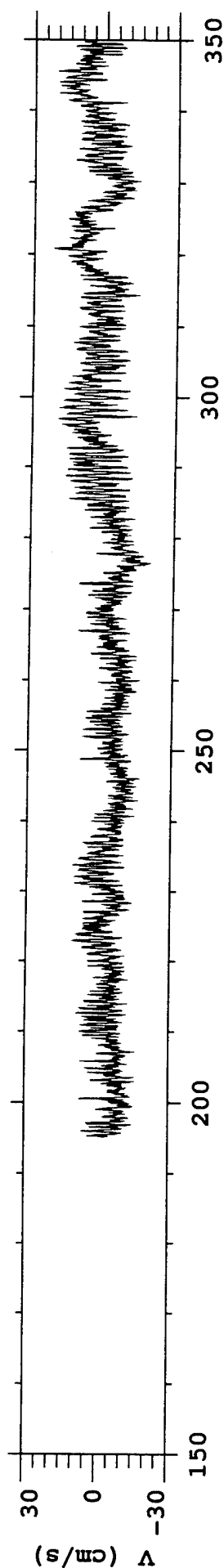
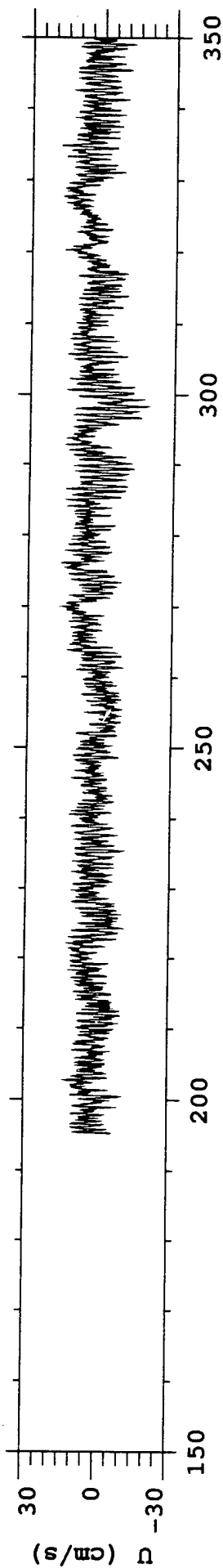


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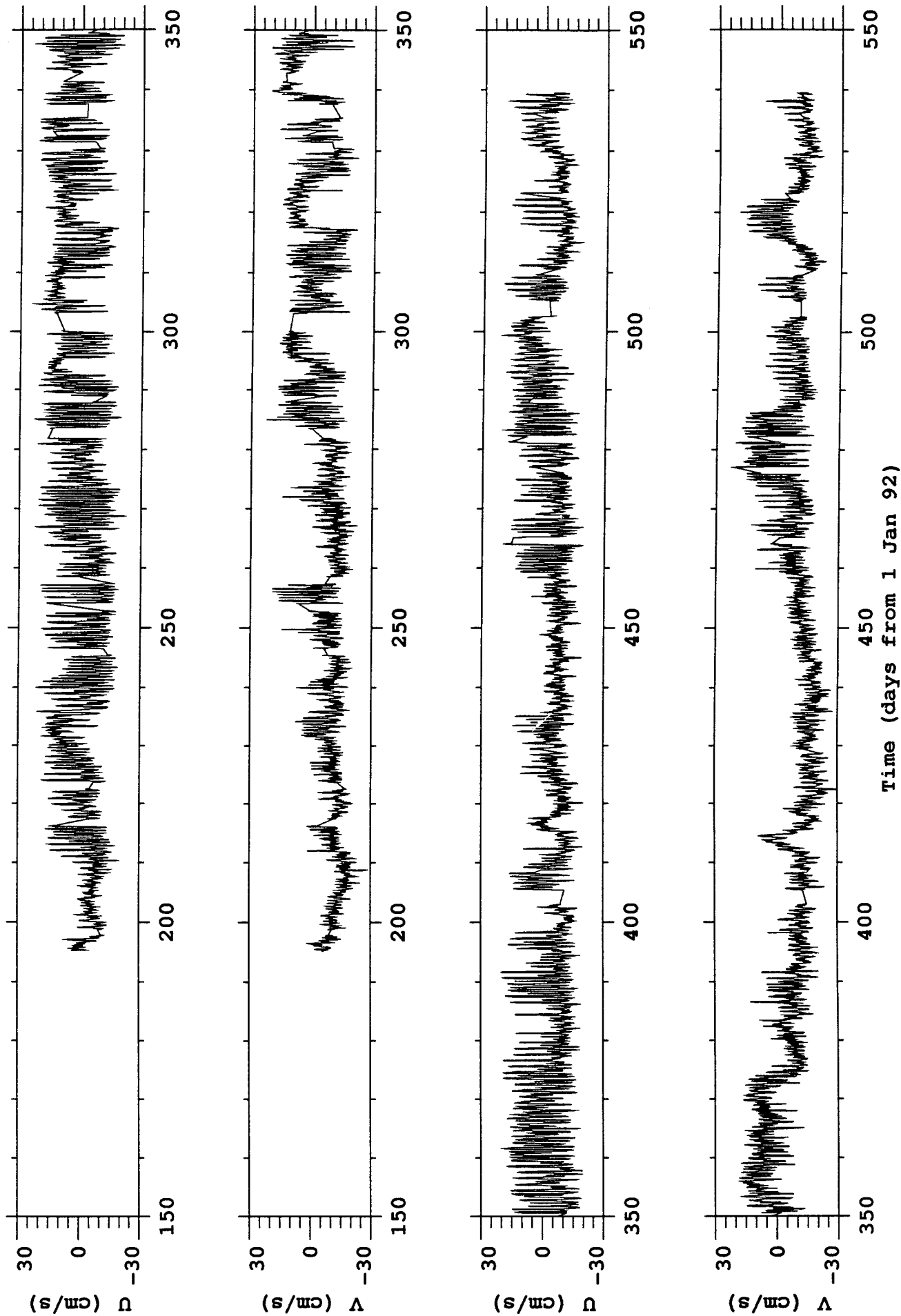


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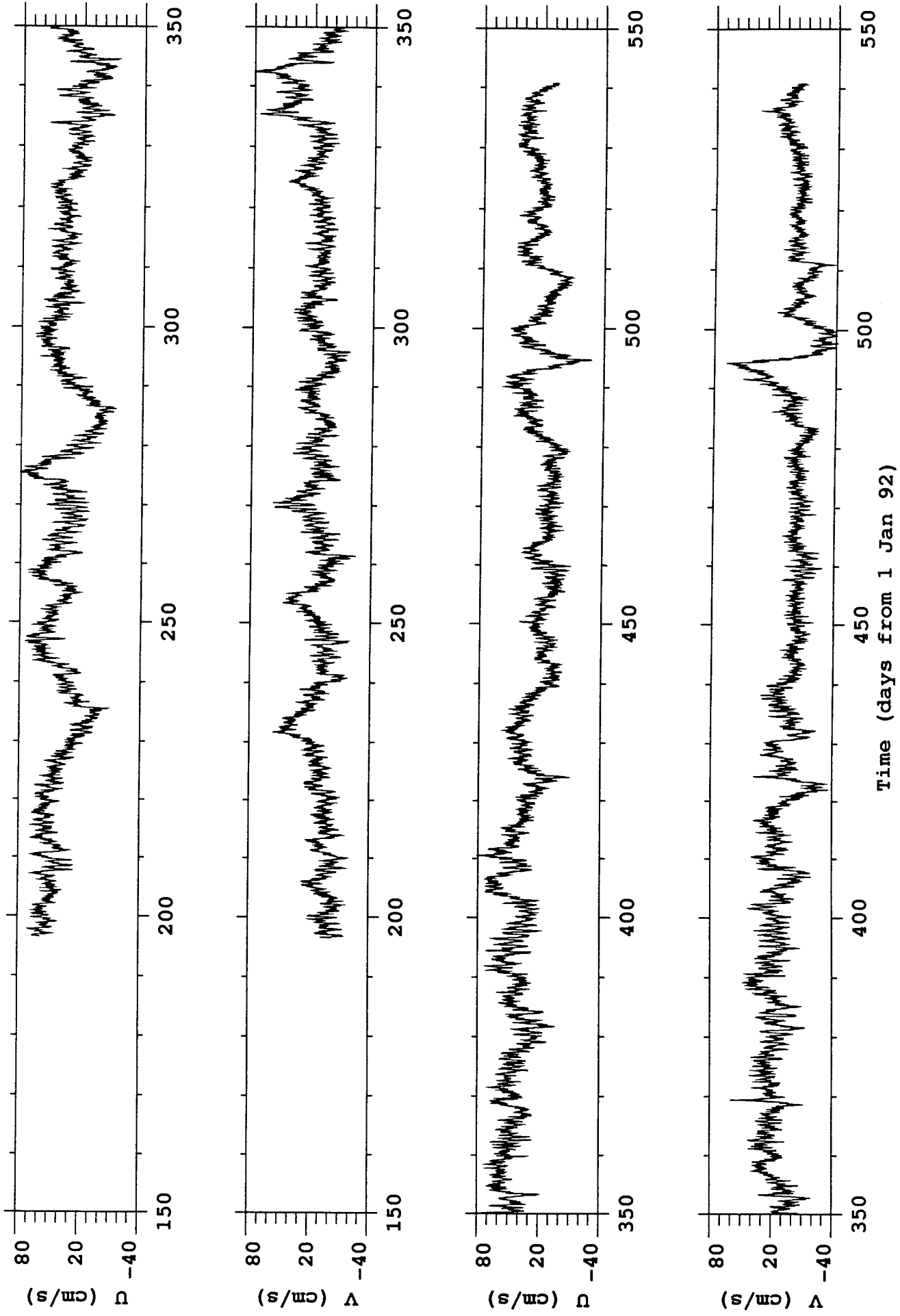
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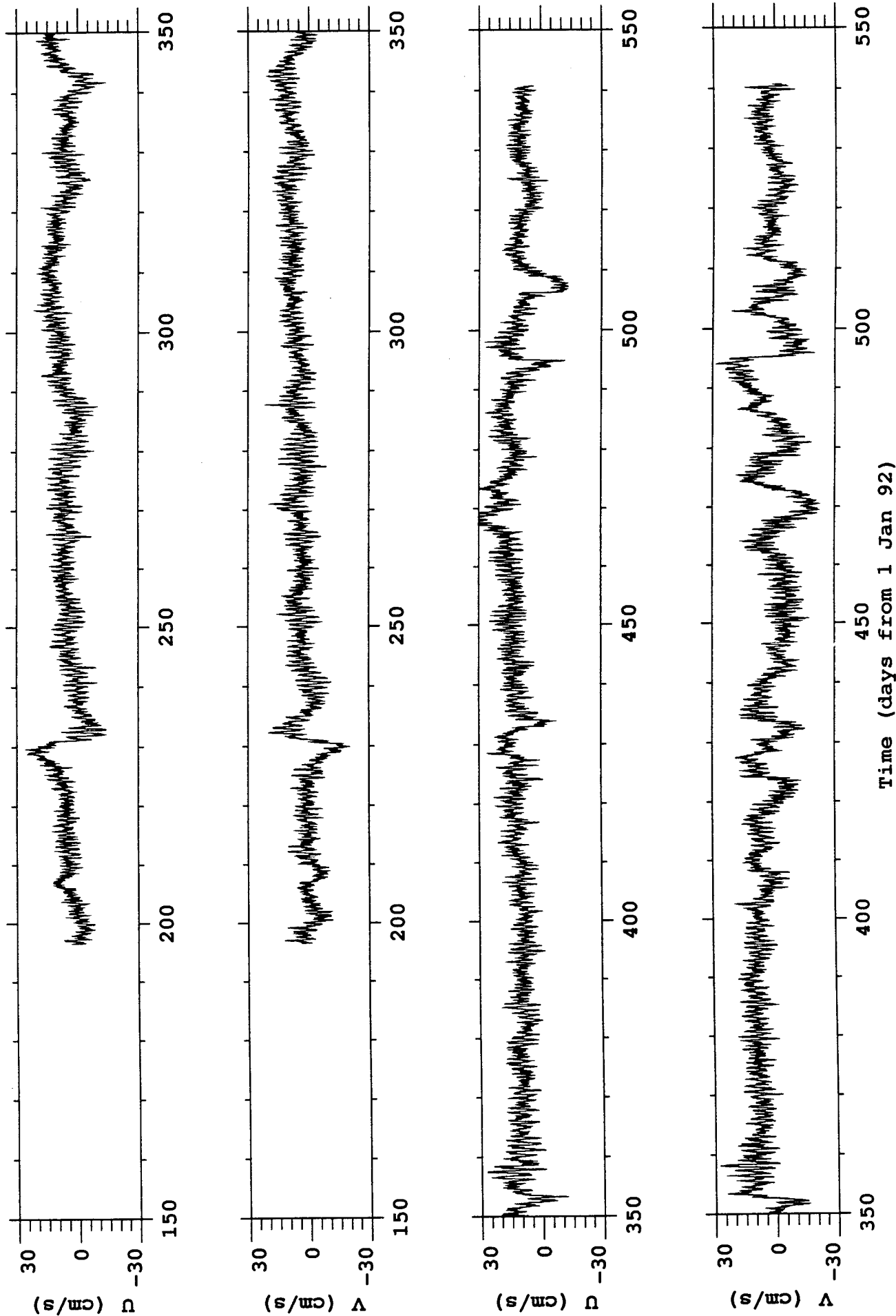
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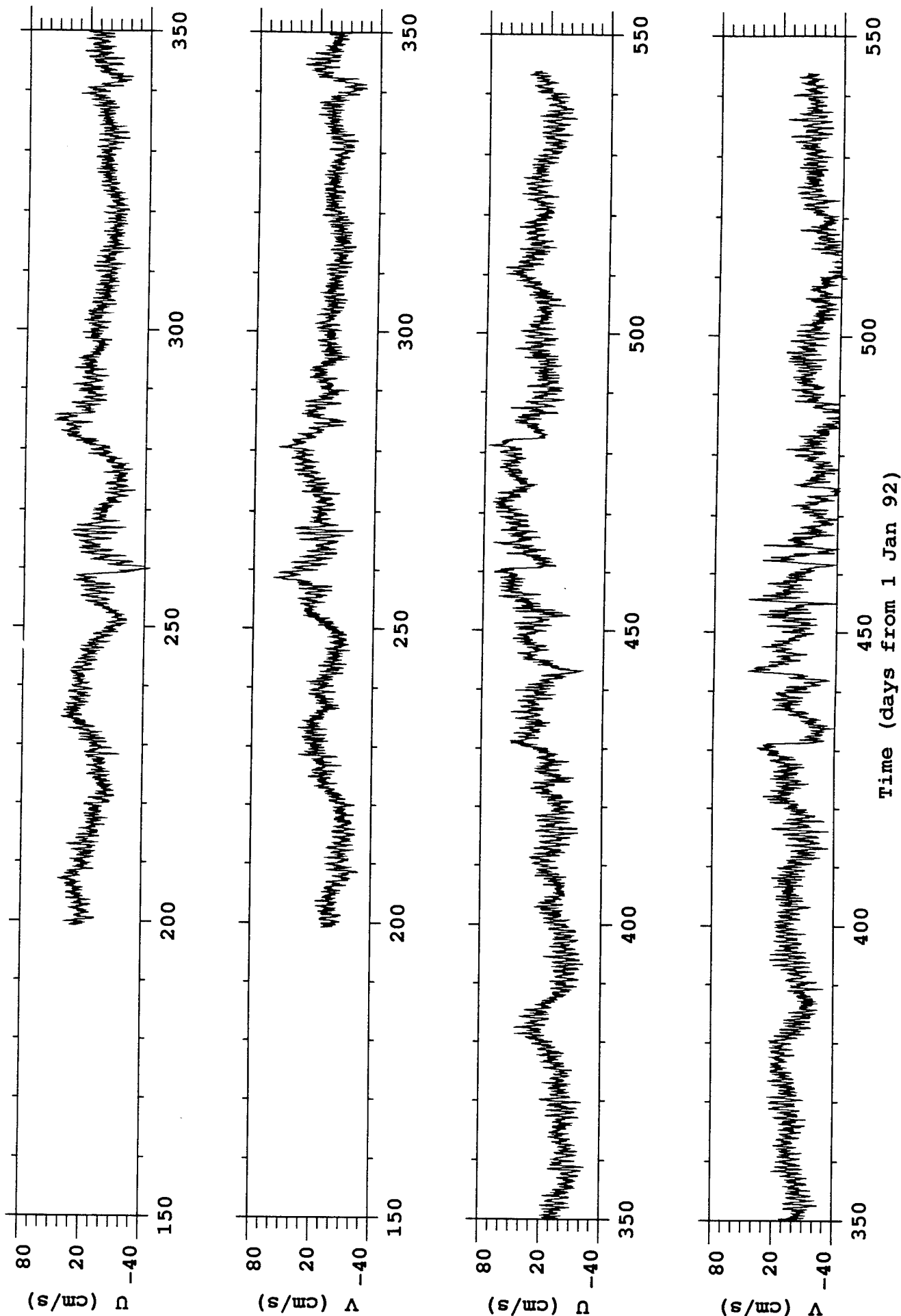
cm92d1



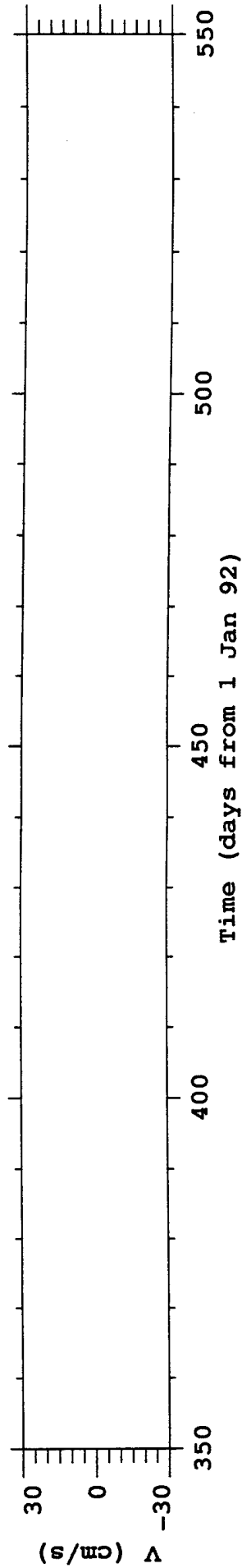
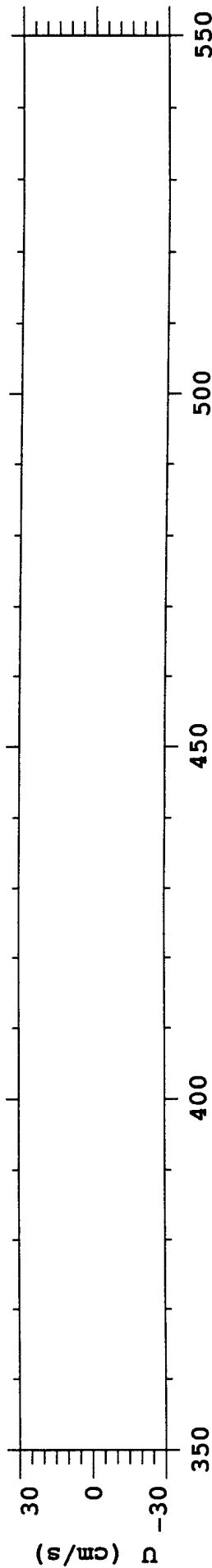
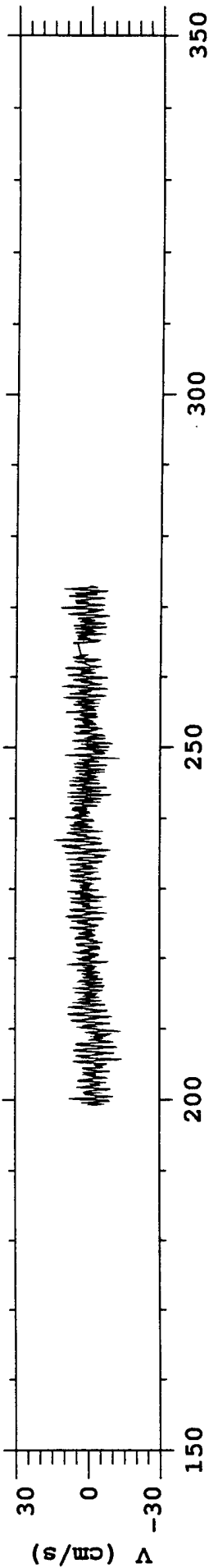
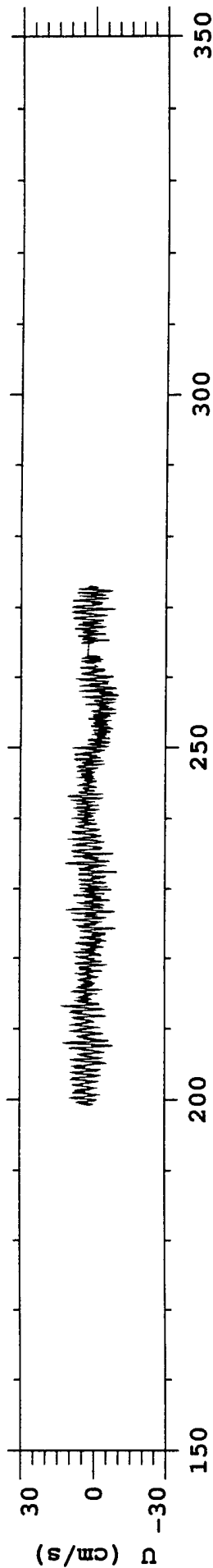
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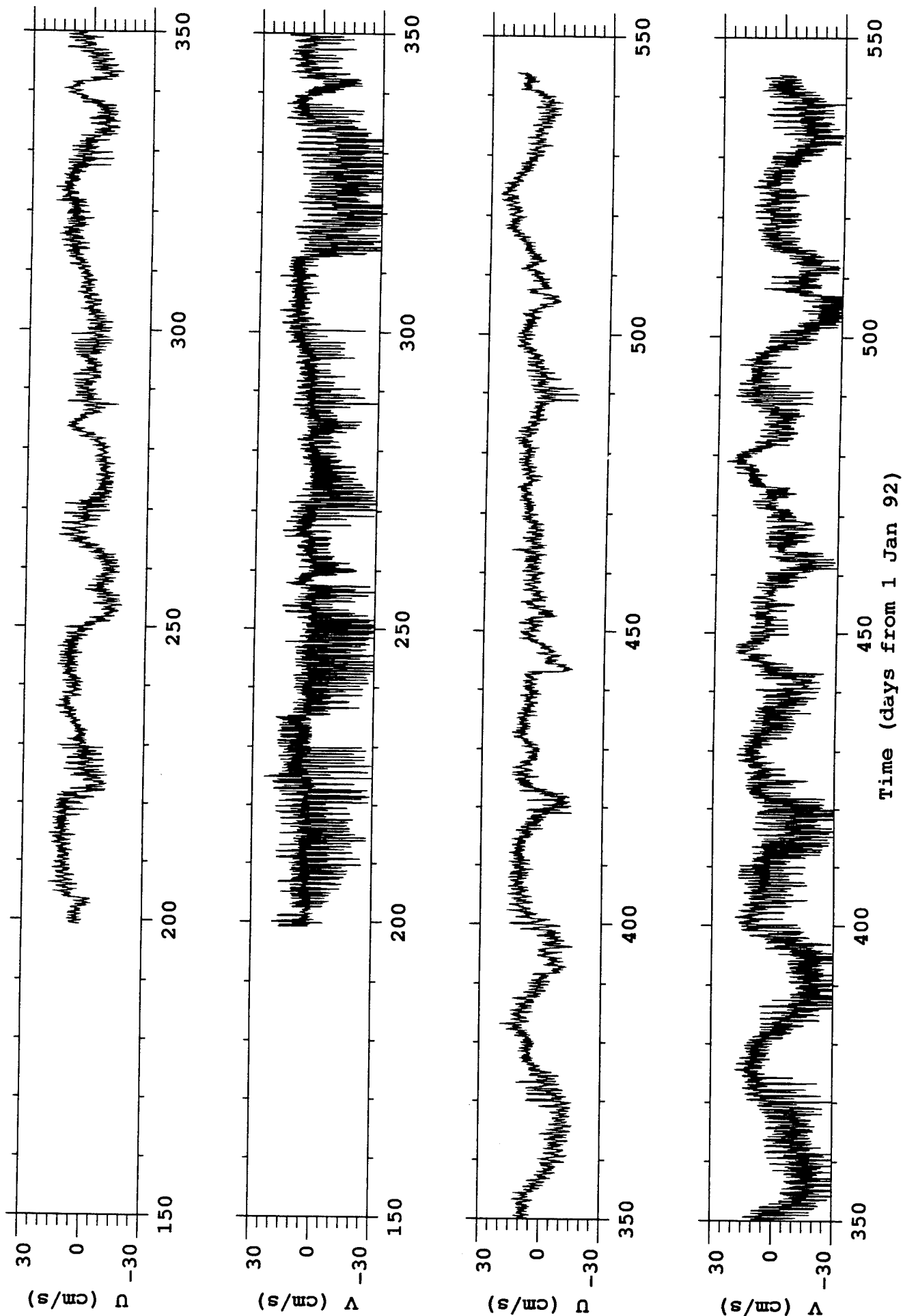
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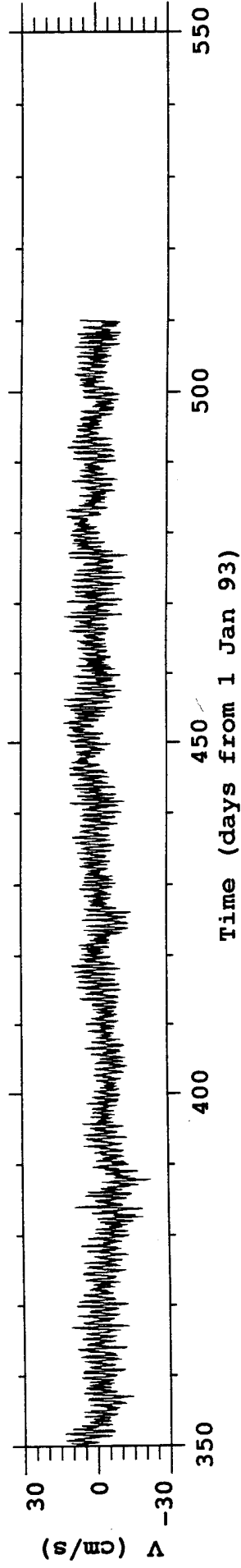
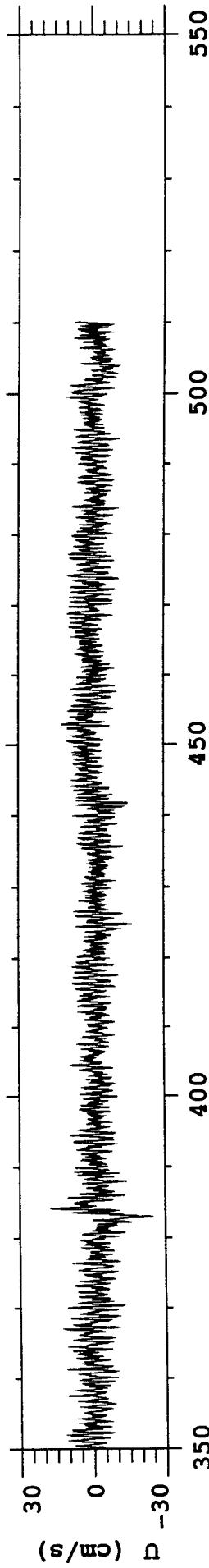
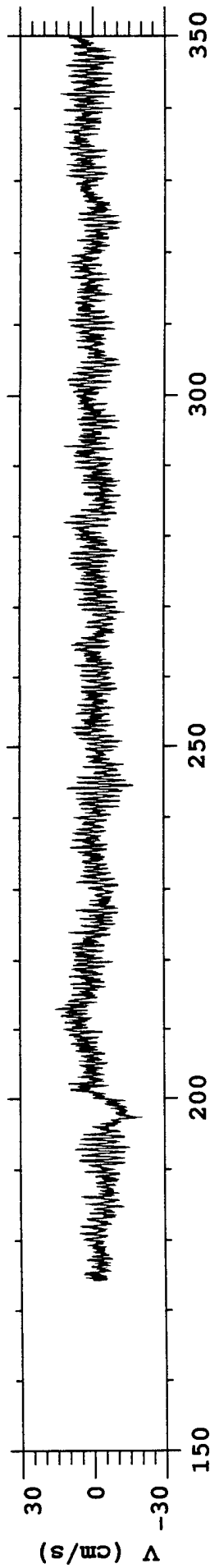
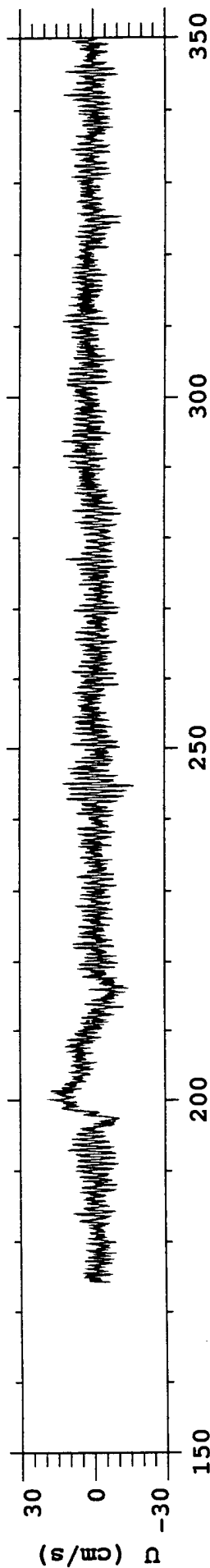
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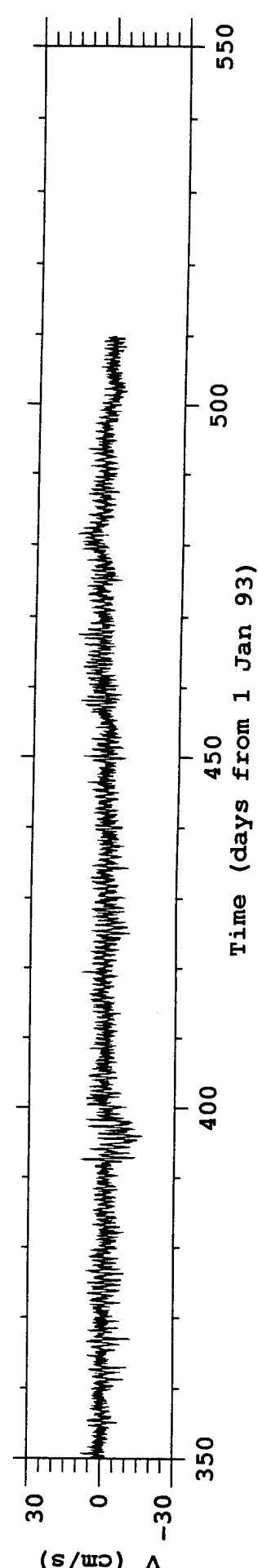
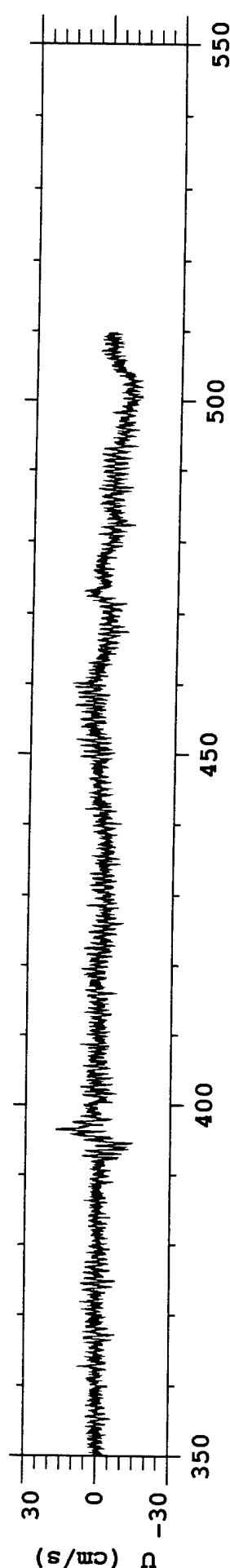
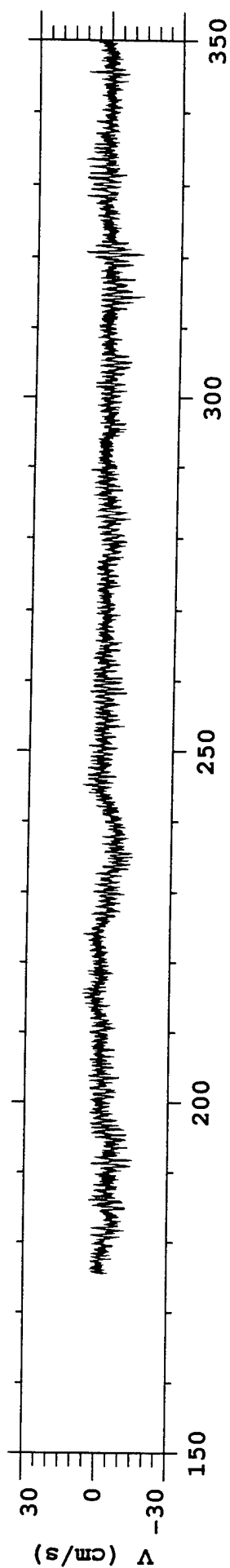
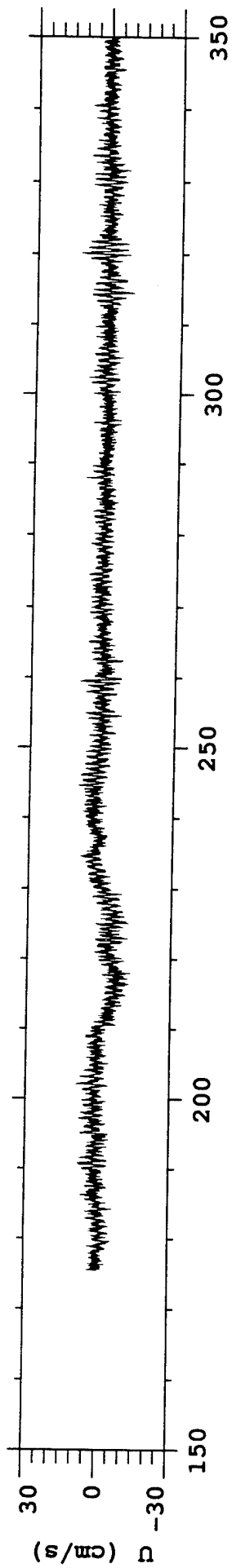
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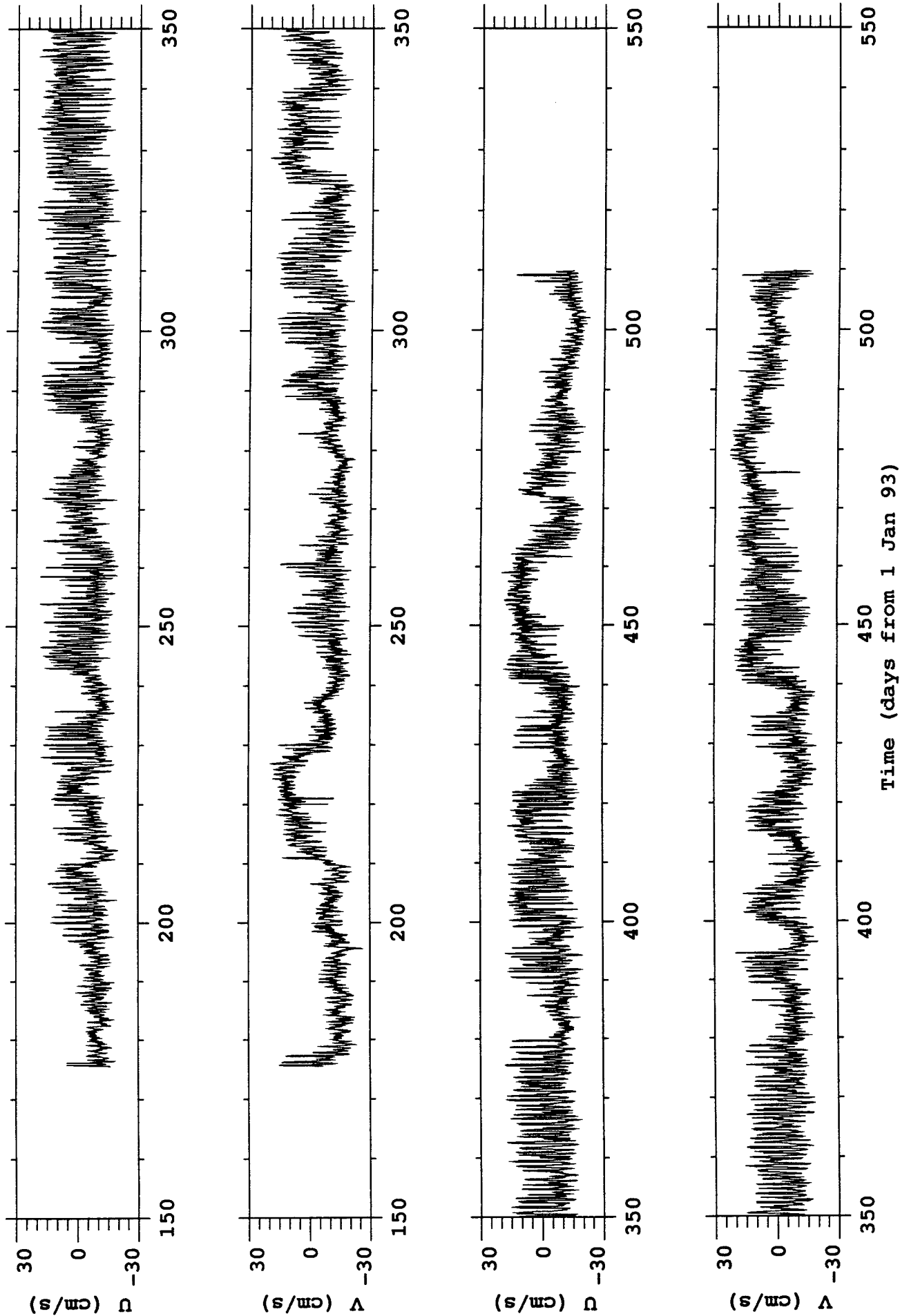
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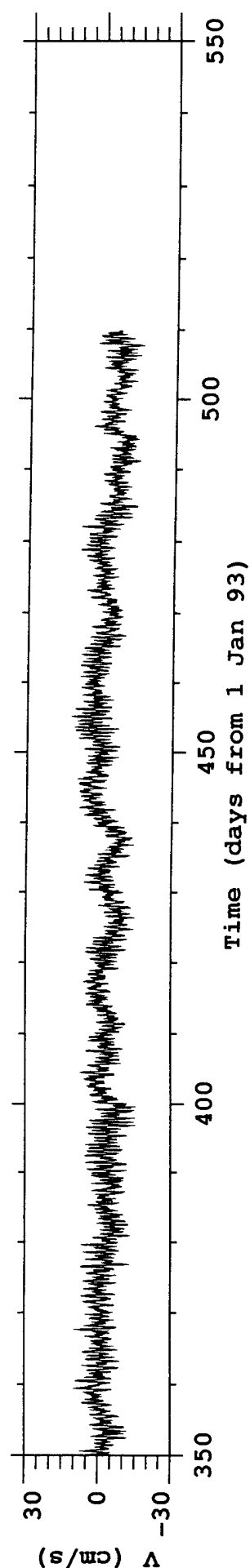
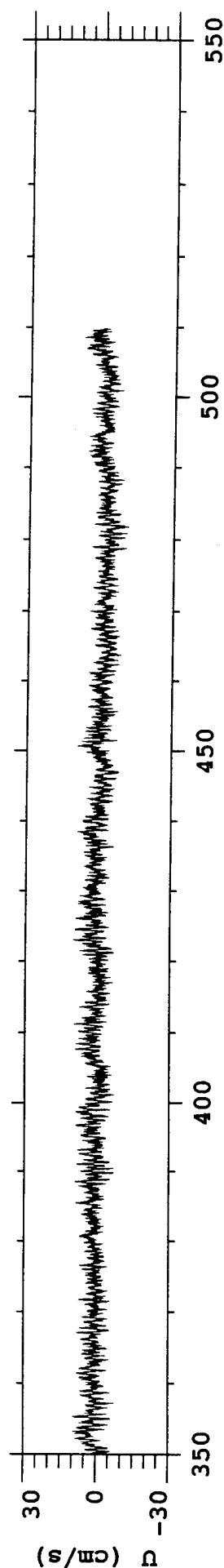
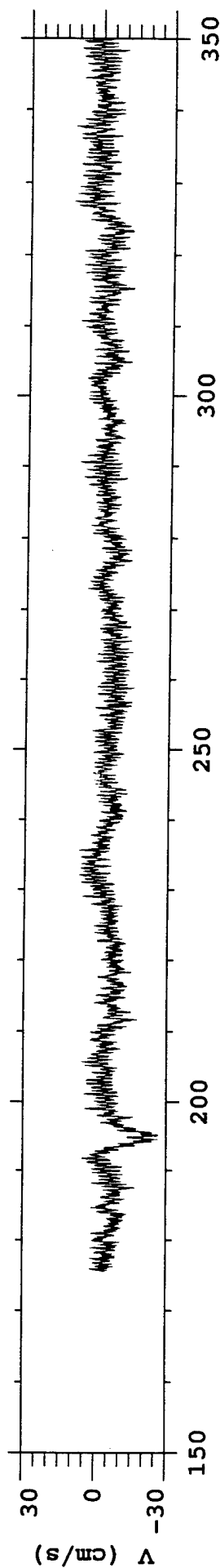
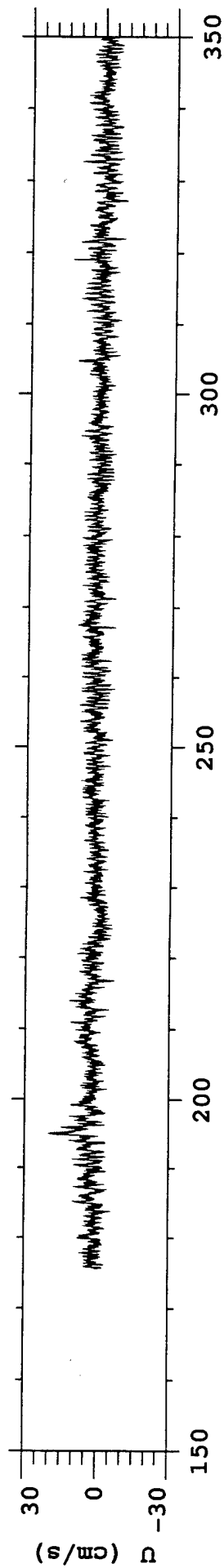
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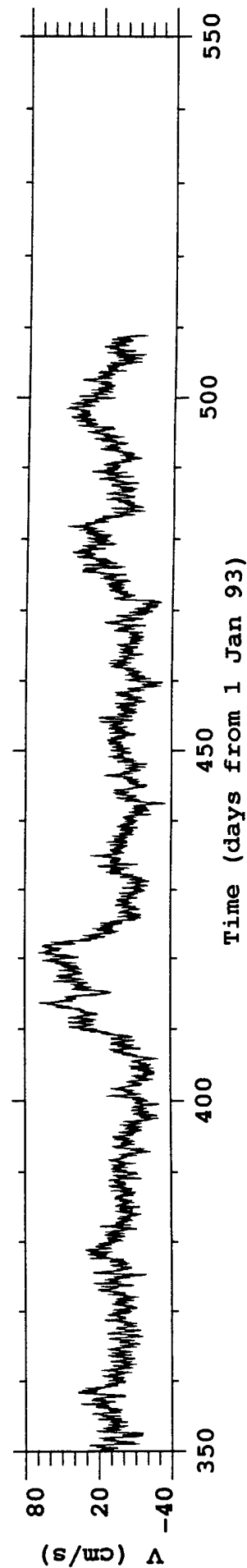
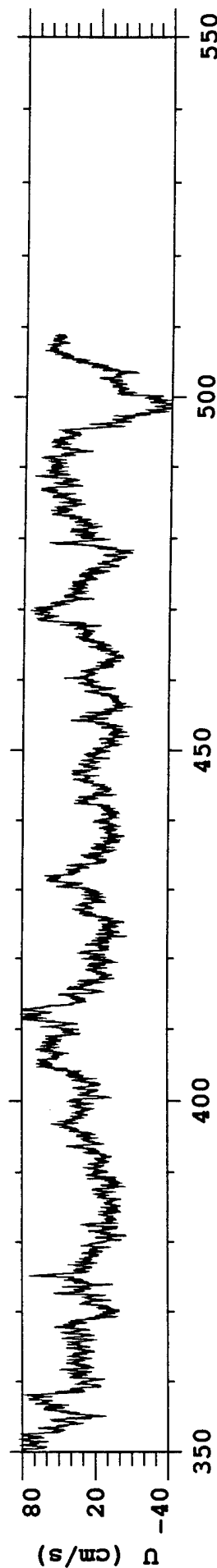
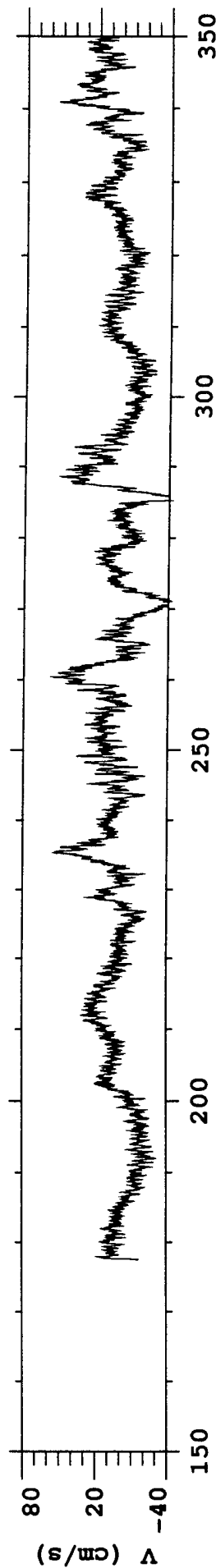
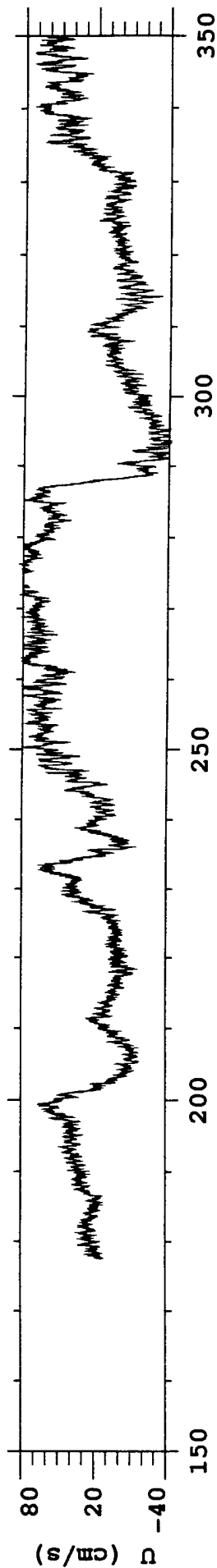
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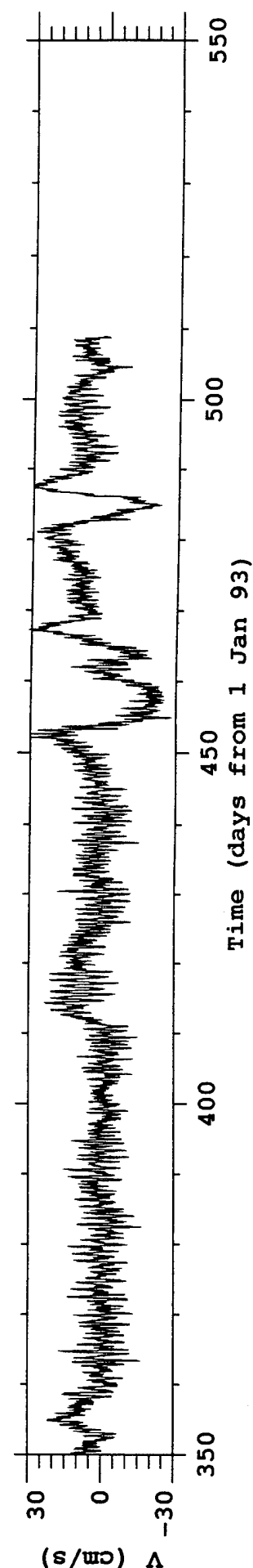
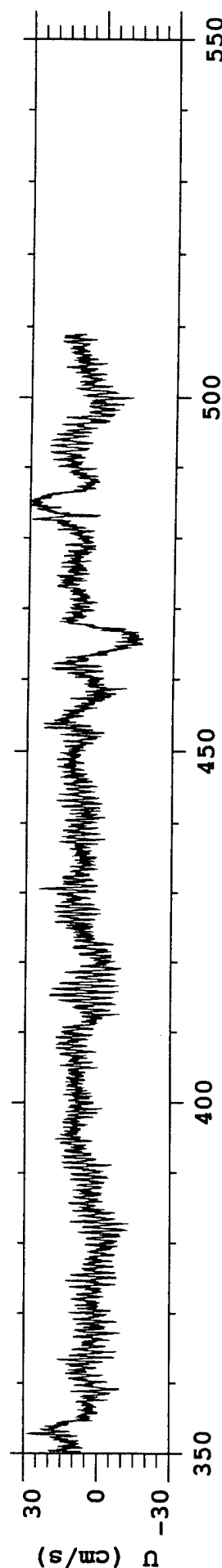
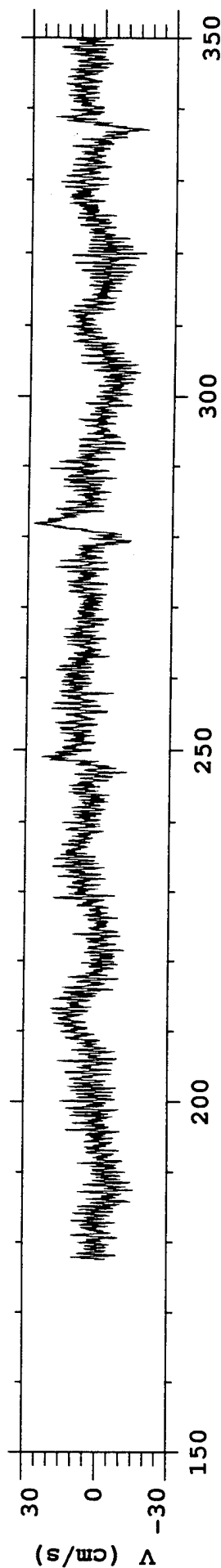
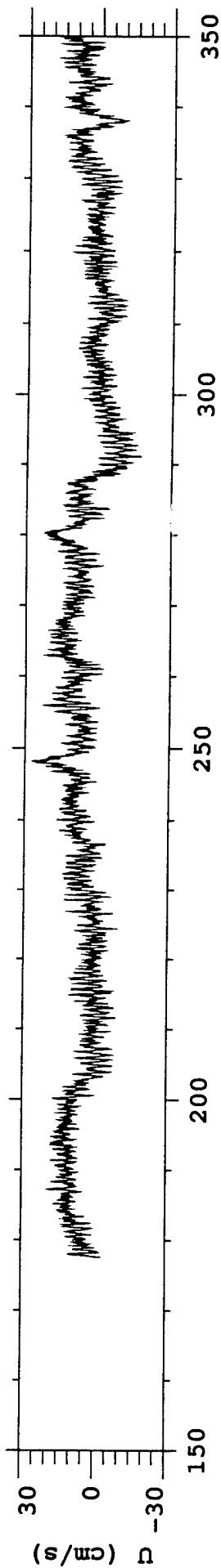
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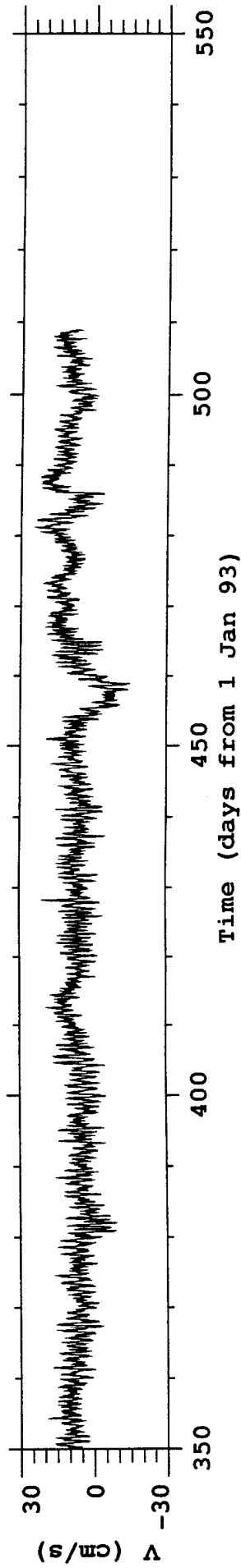
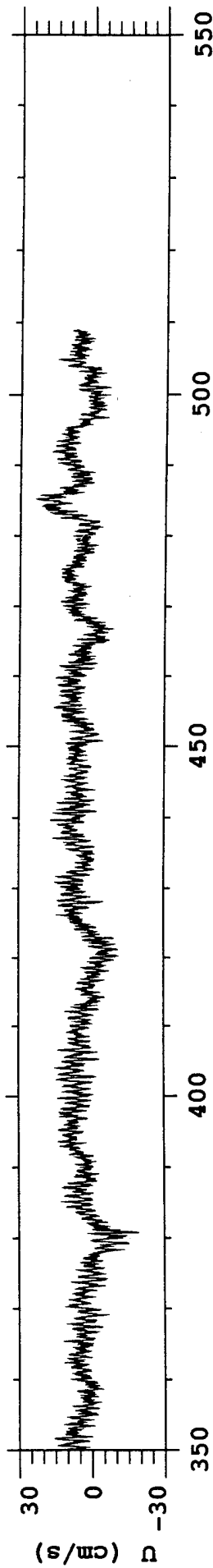
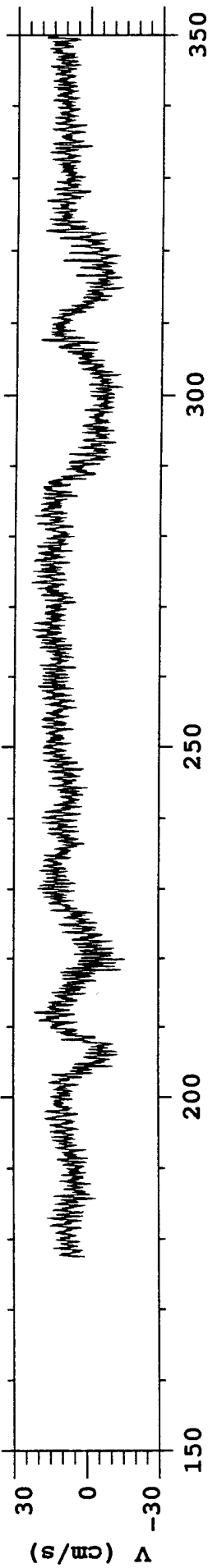
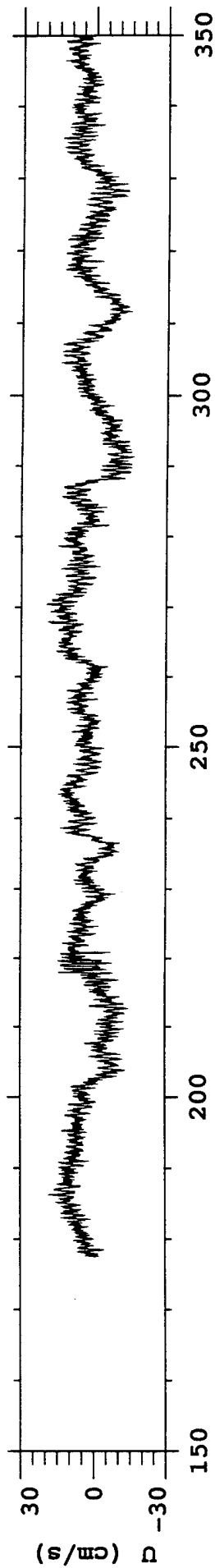
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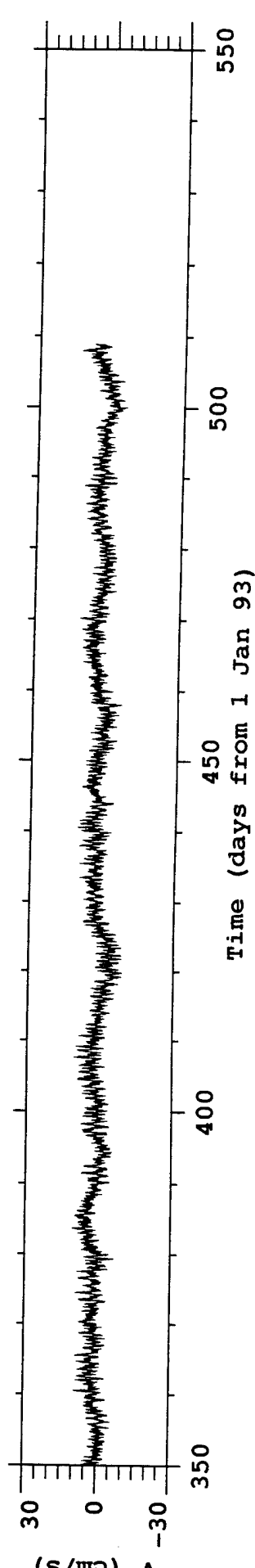
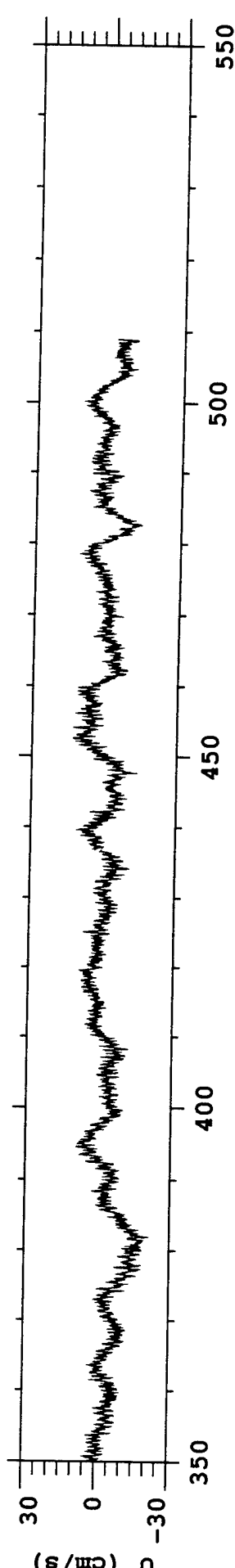
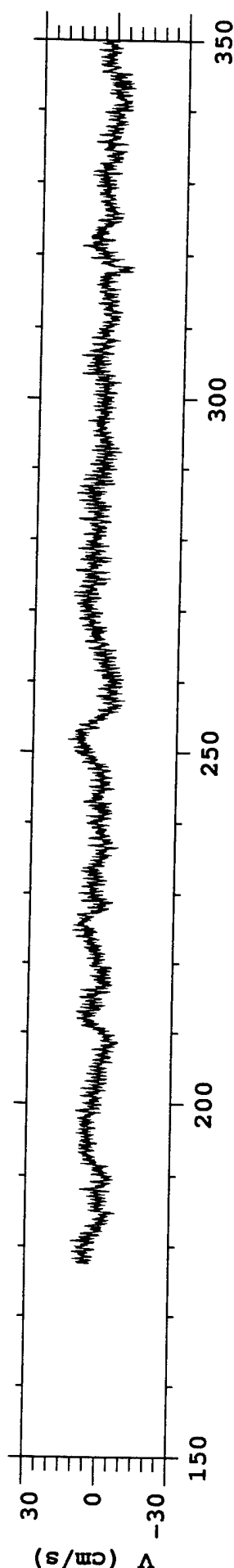
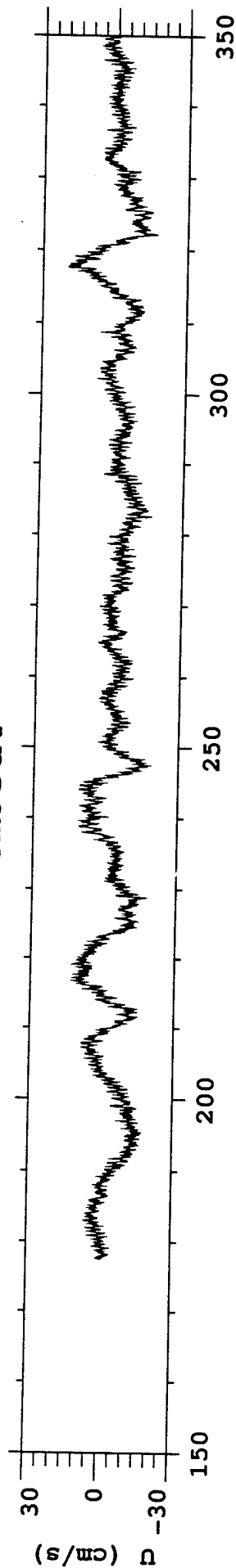
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cm93d3

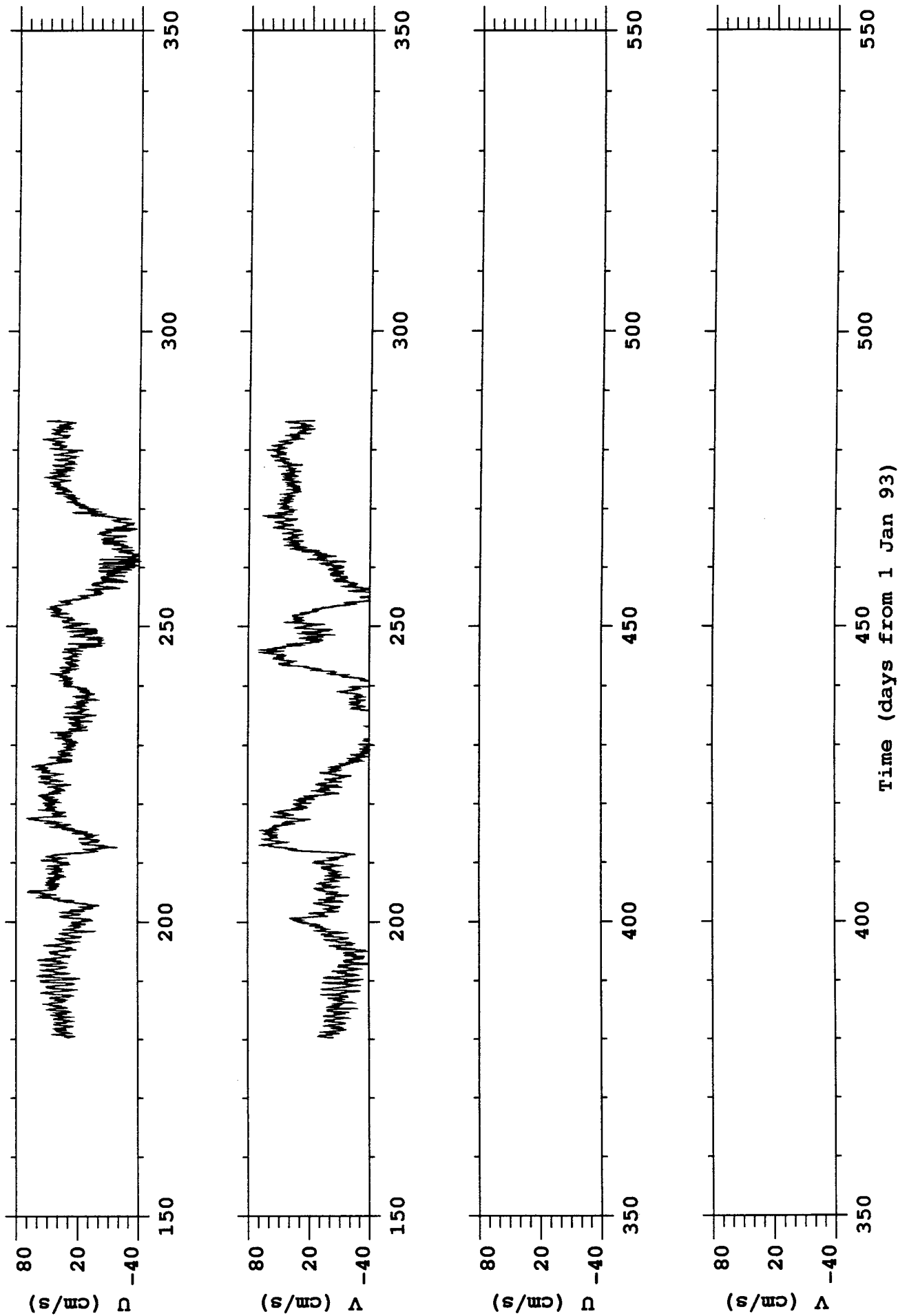


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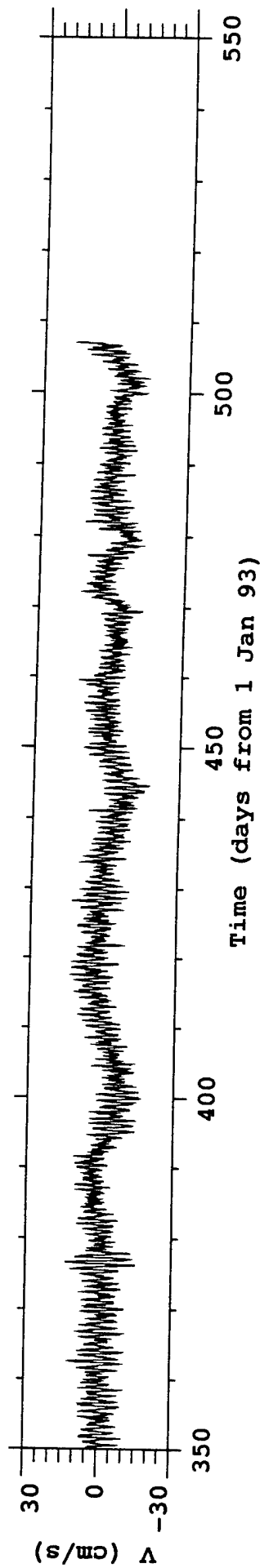
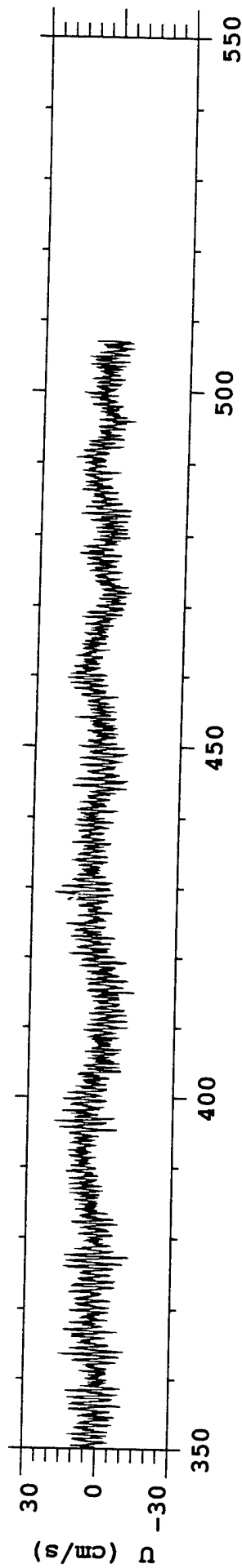
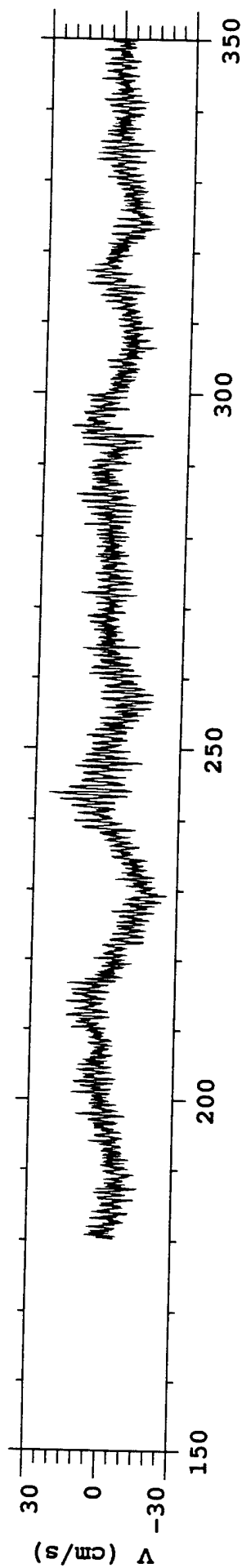
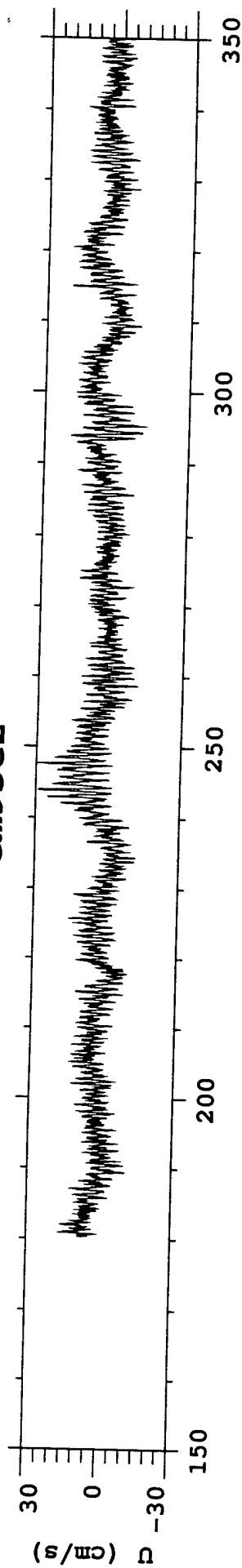


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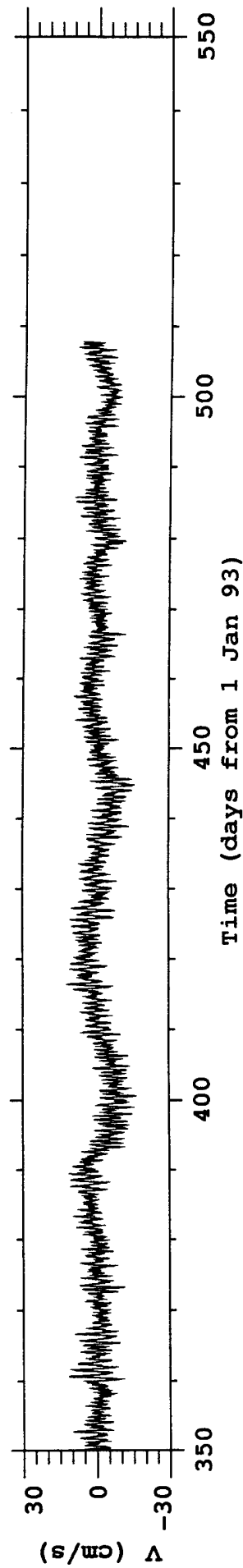
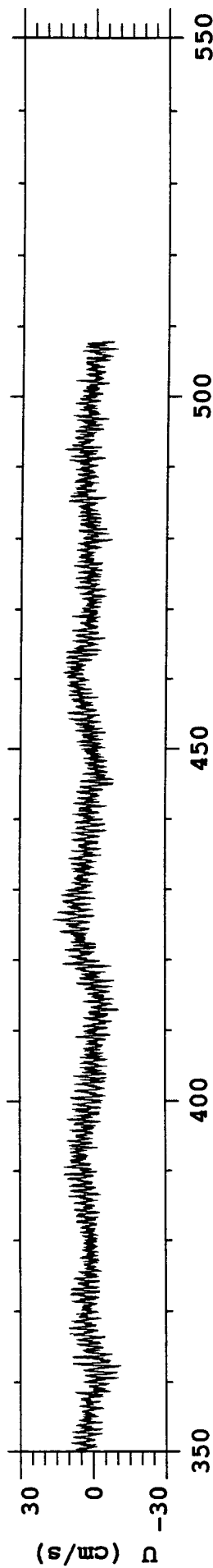
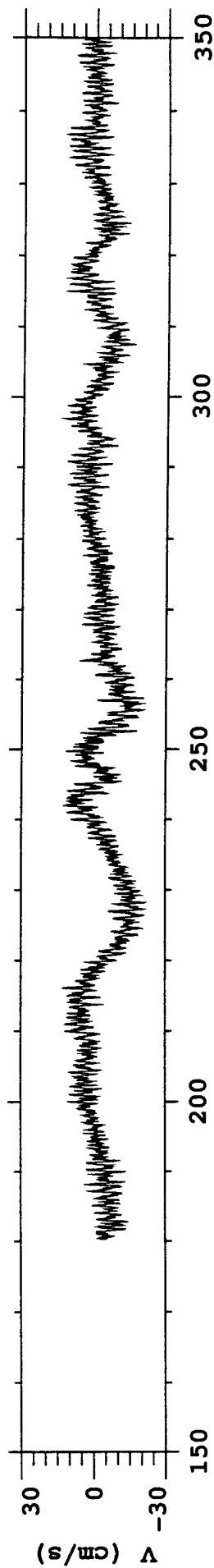
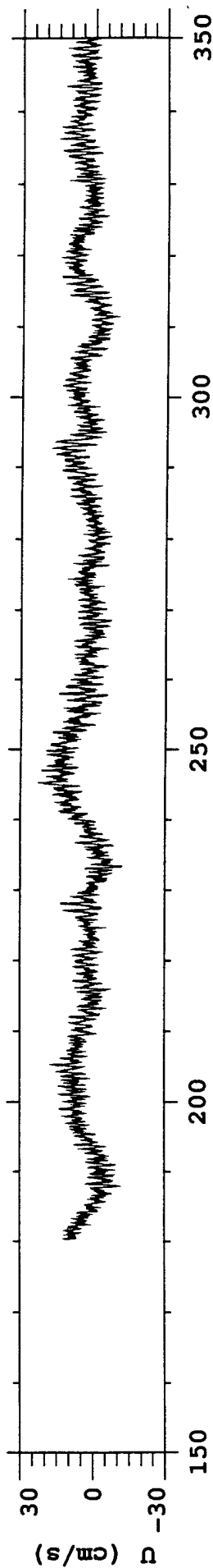
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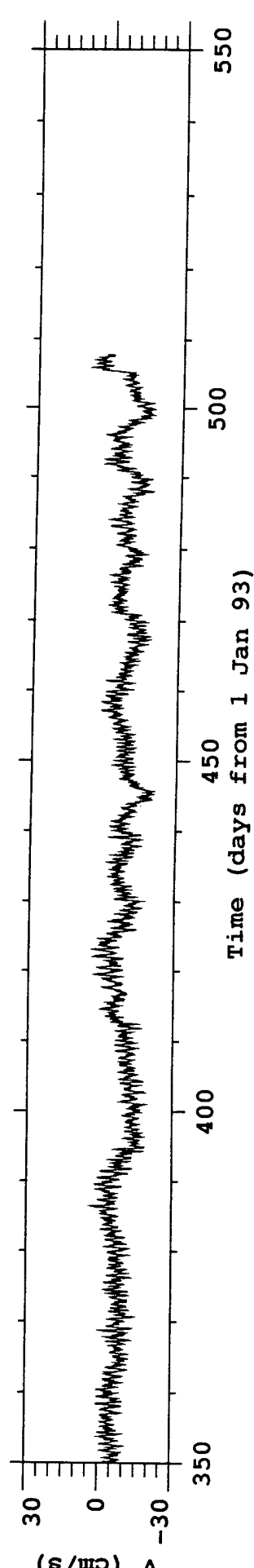
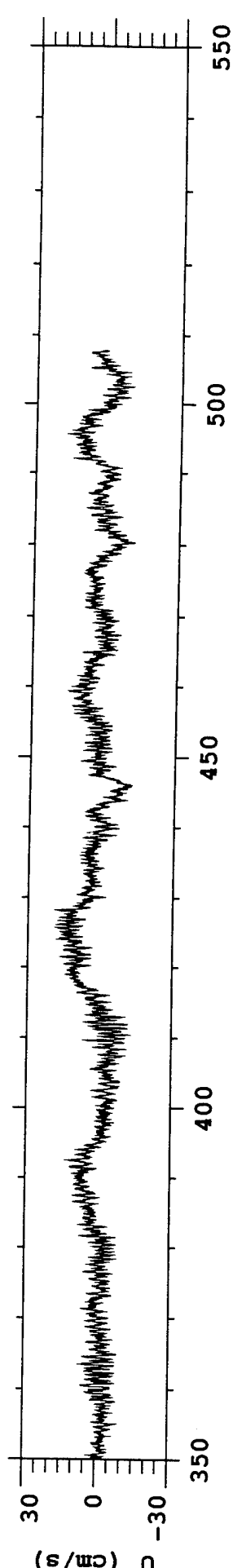
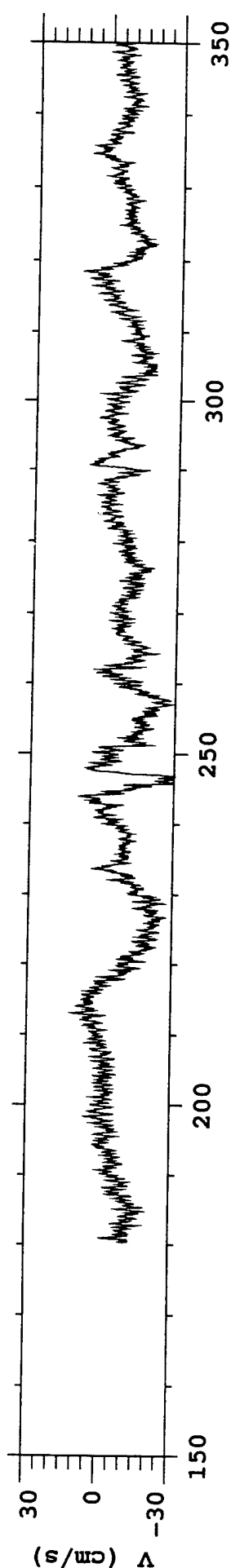
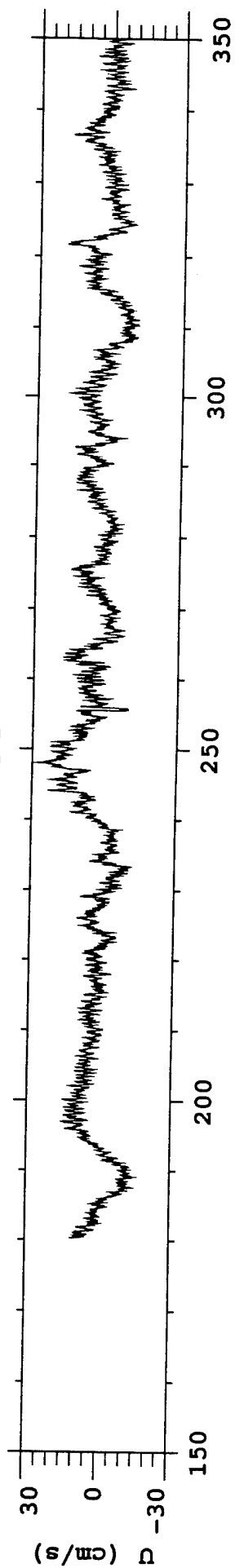
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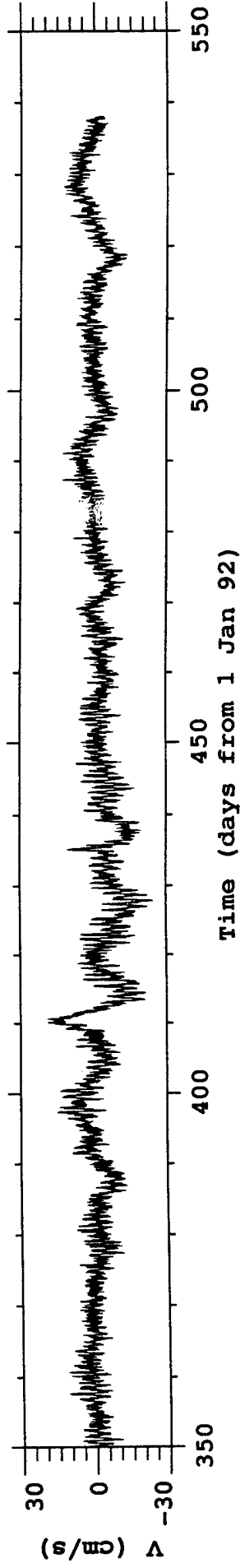
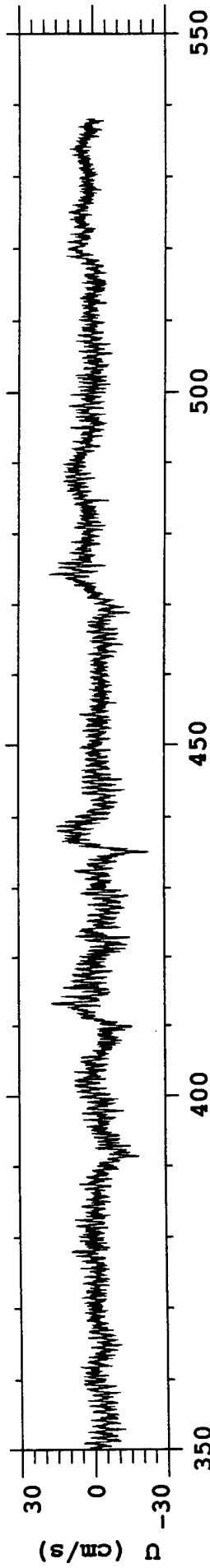
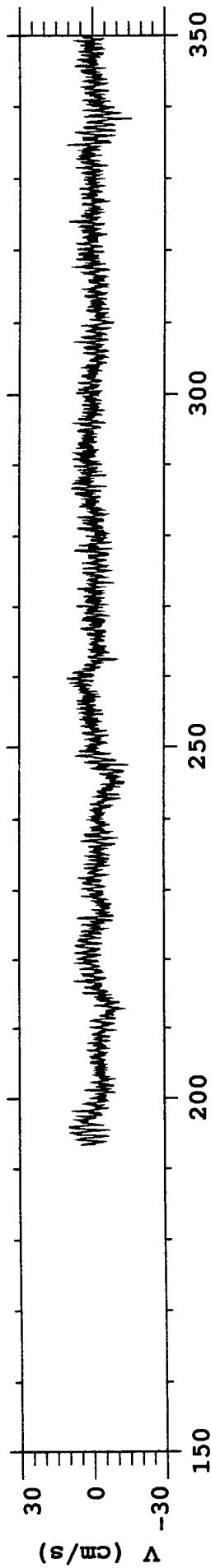
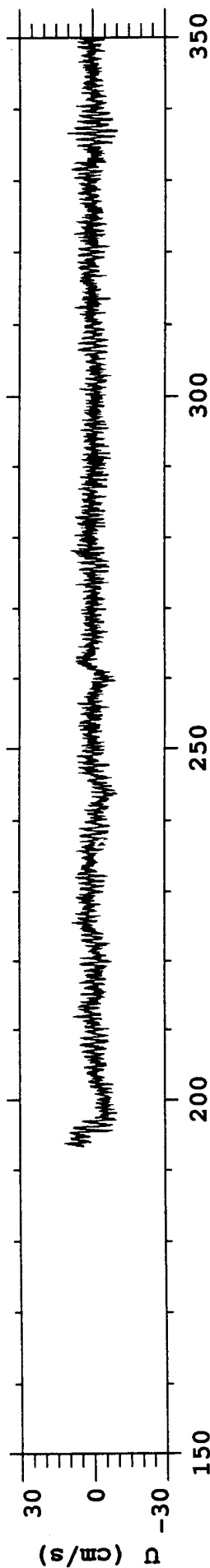
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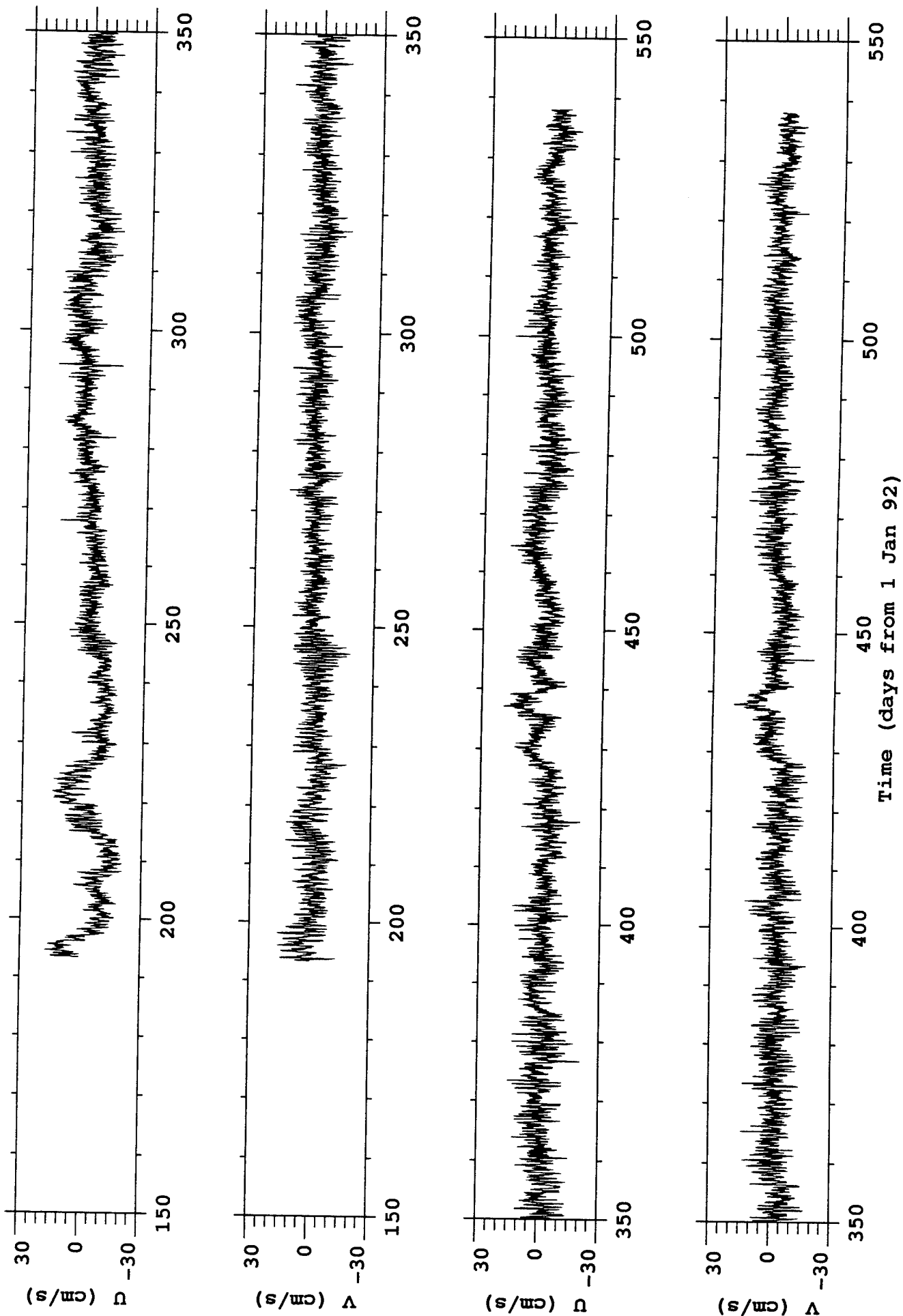
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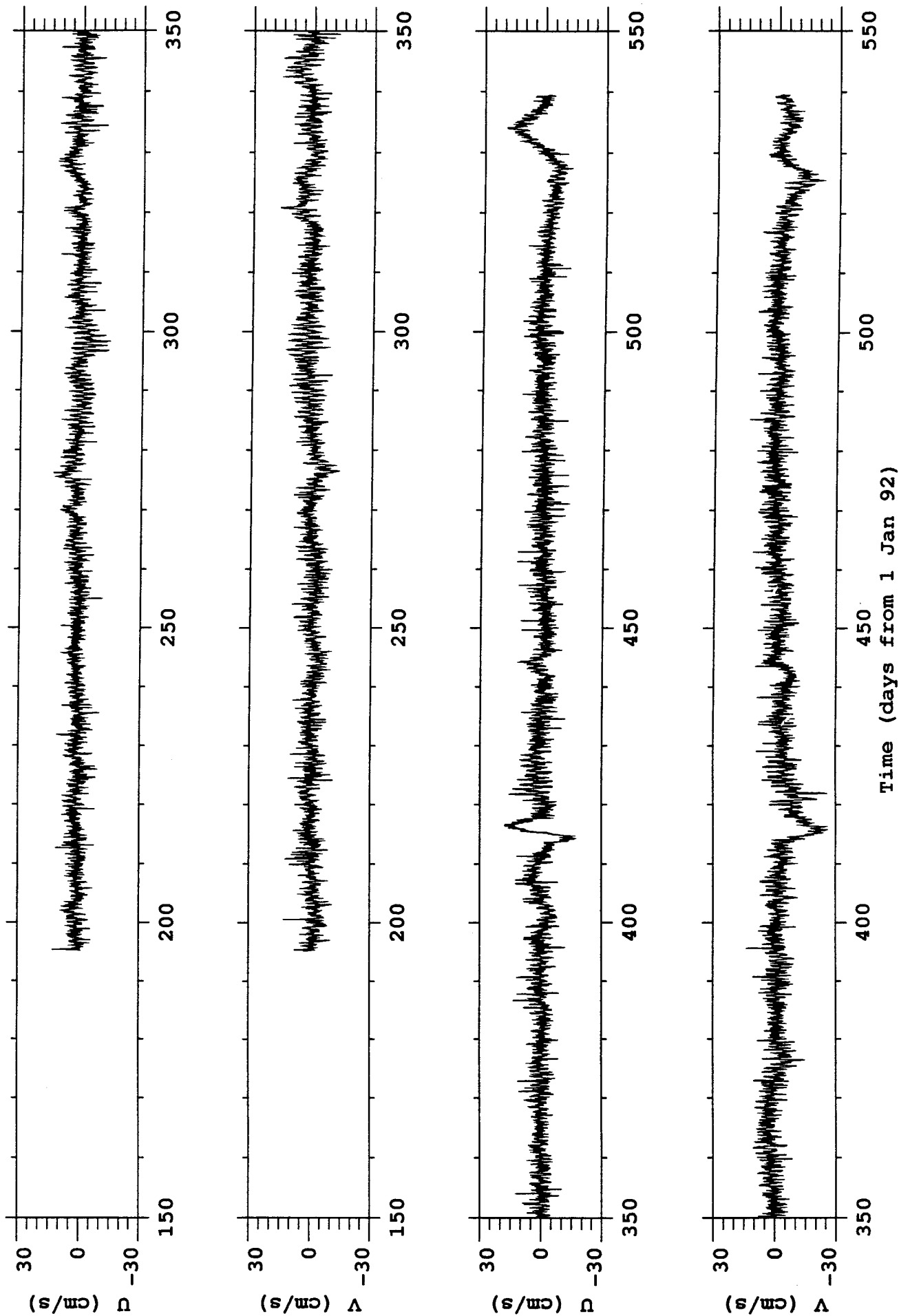
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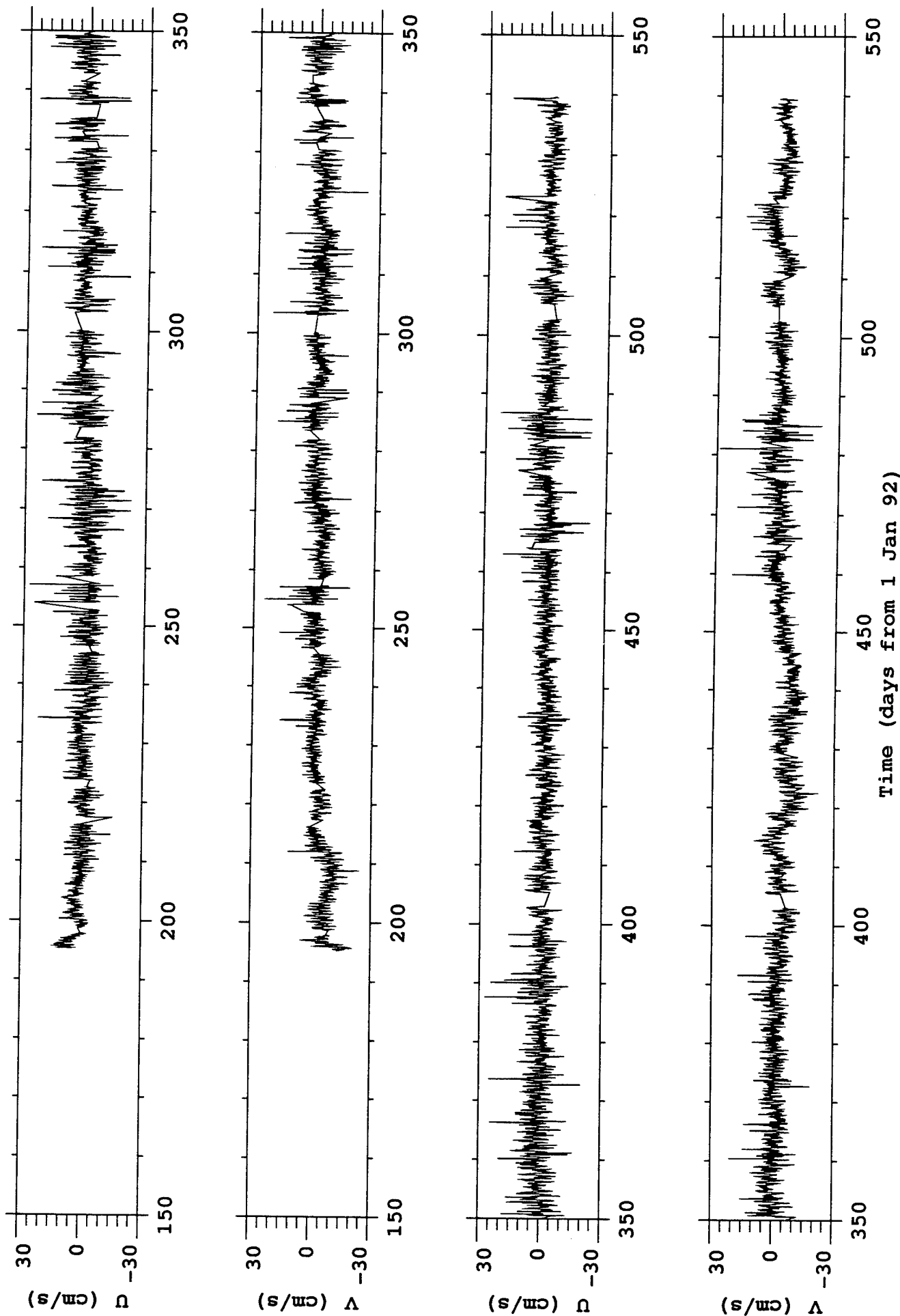
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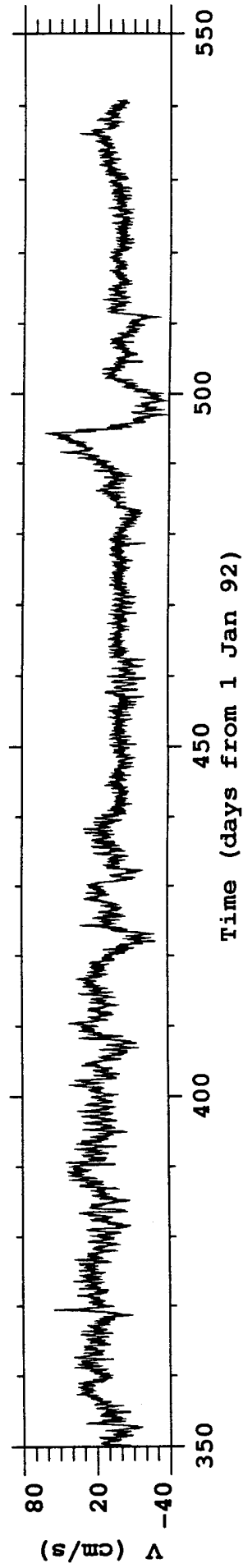
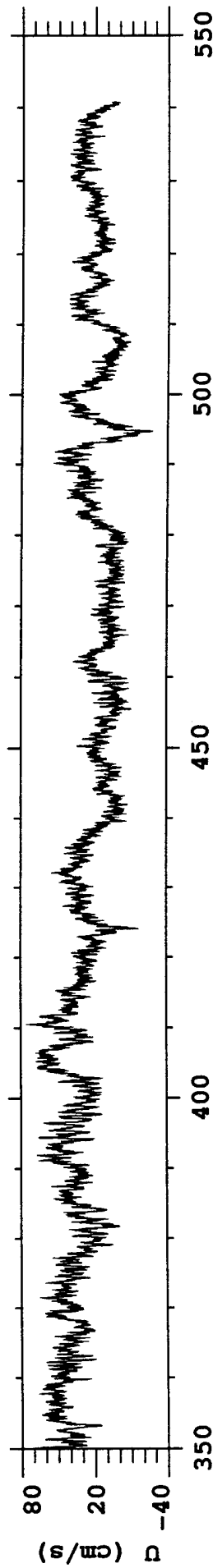
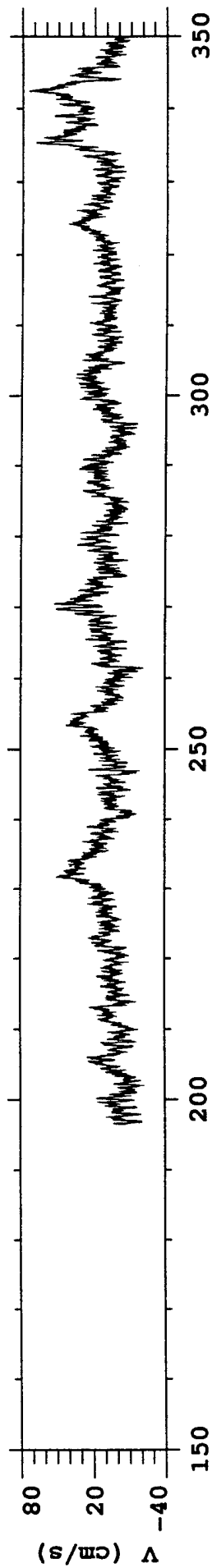
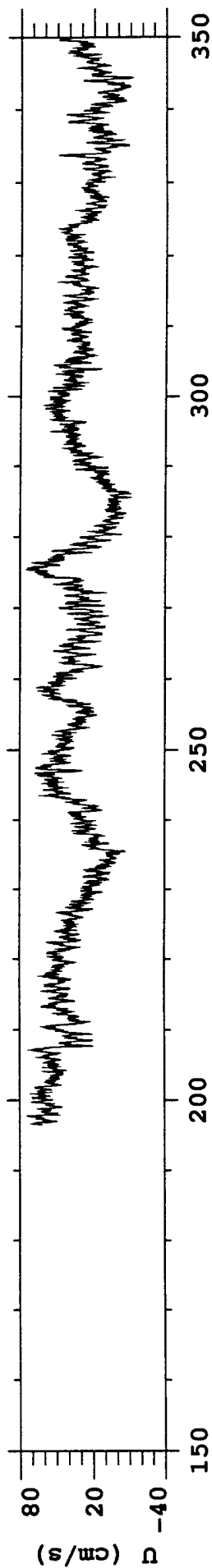
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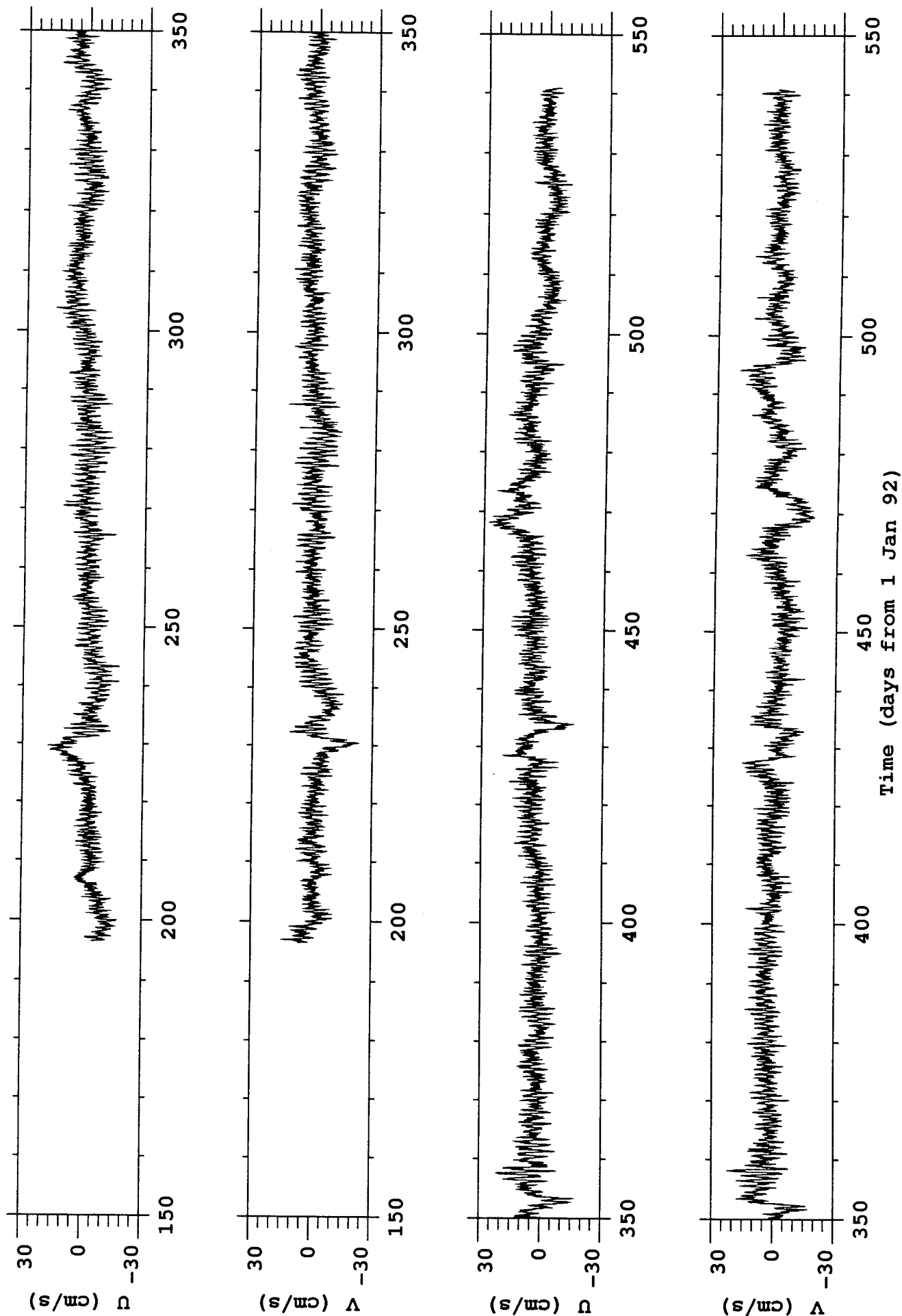
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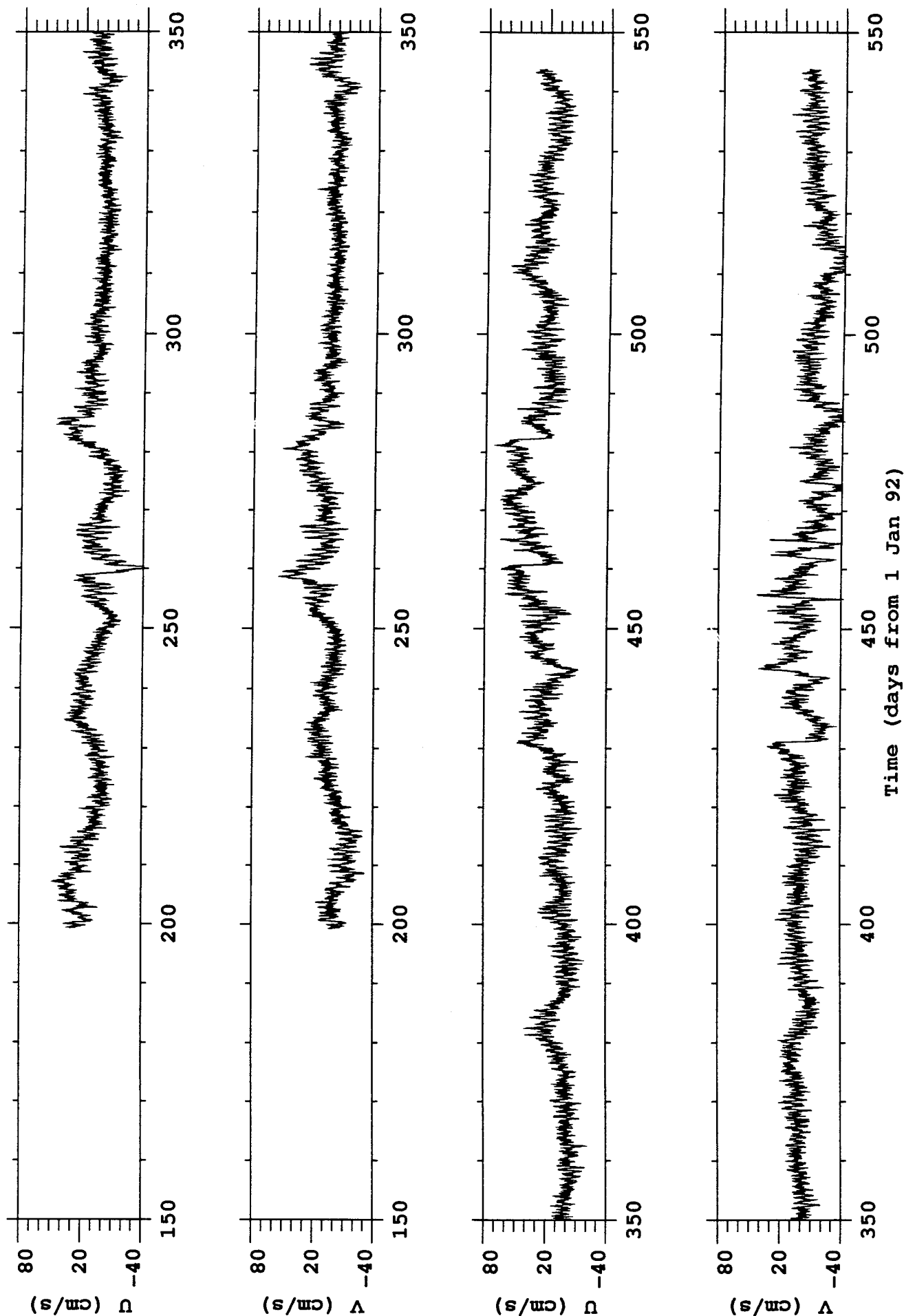
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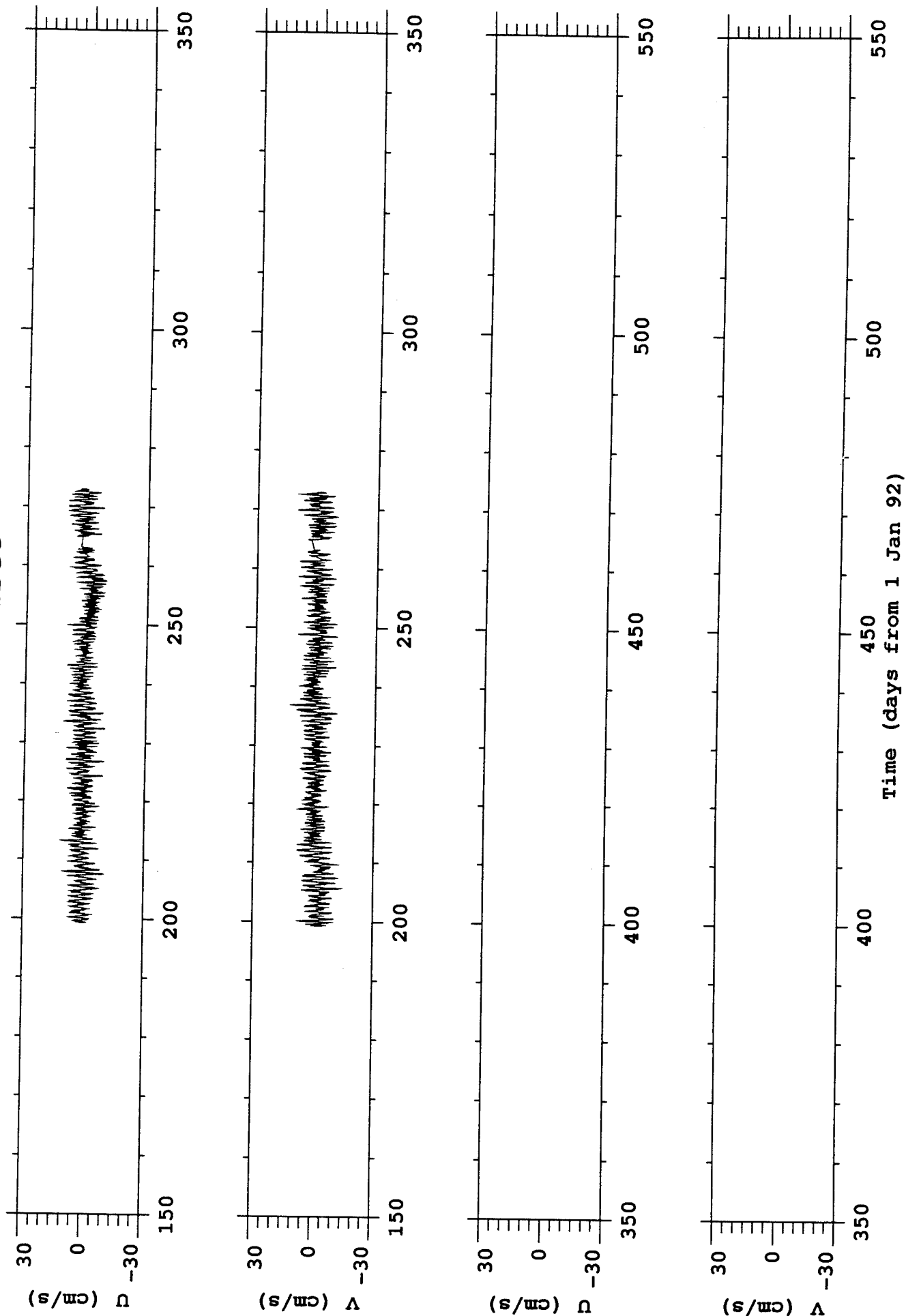
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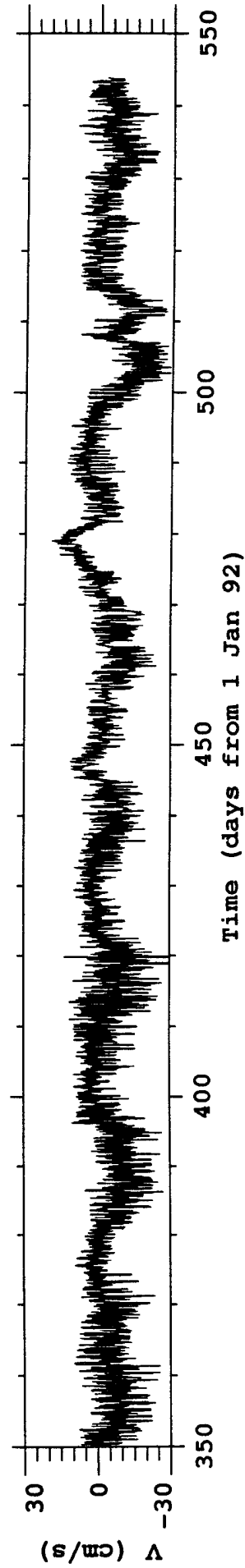
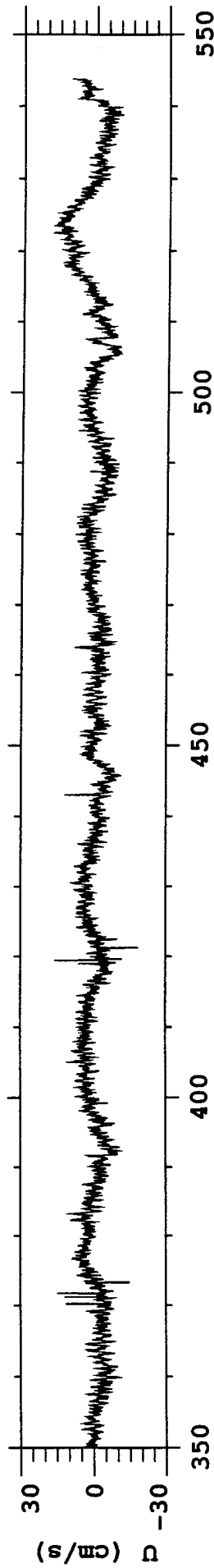
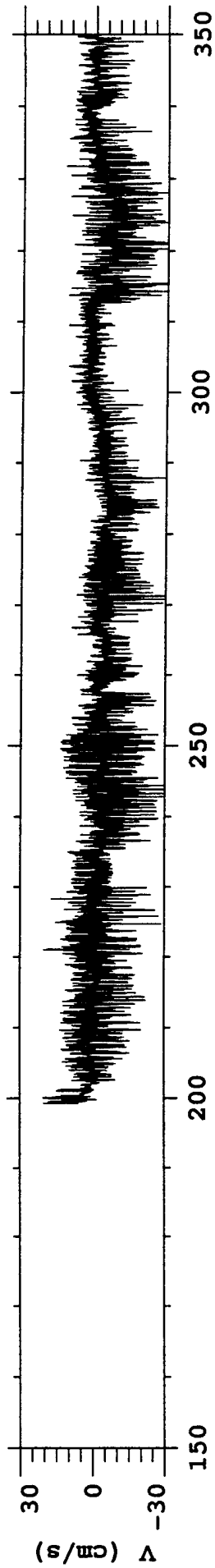
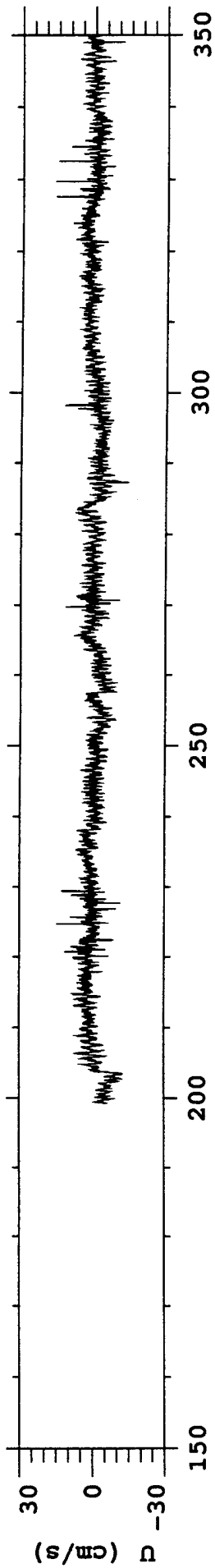
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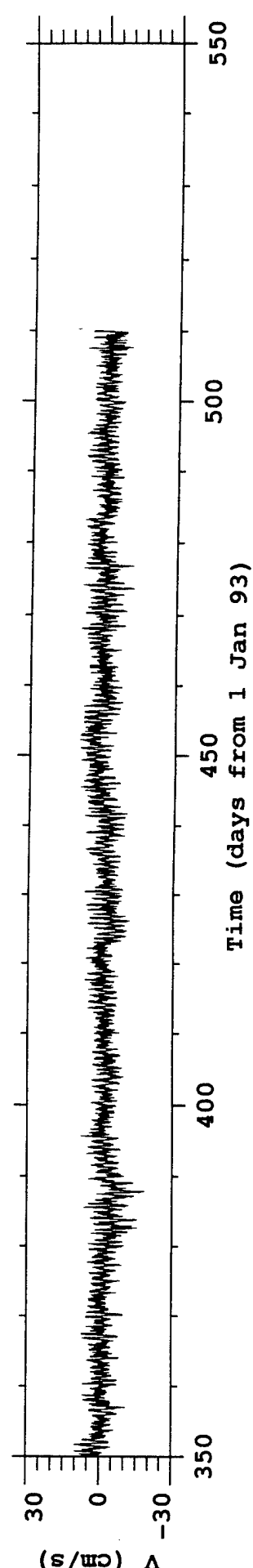
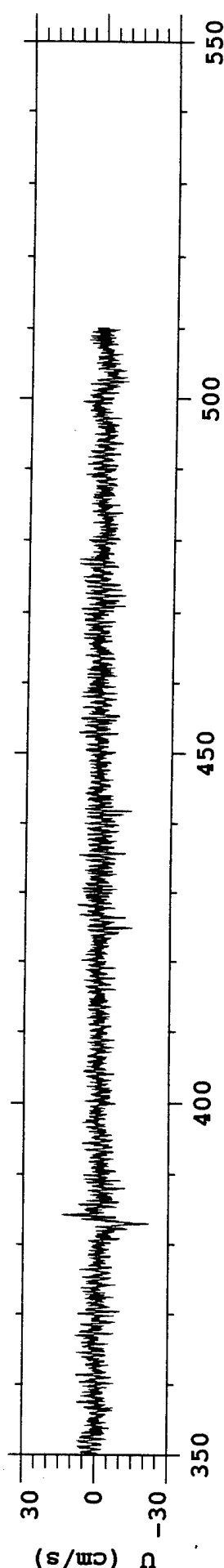
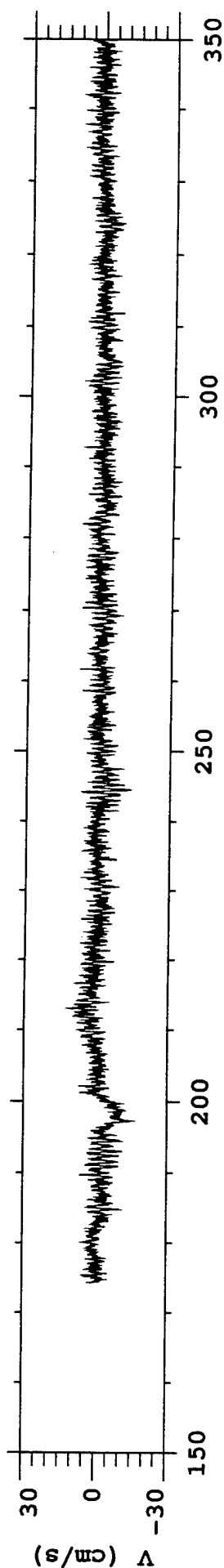
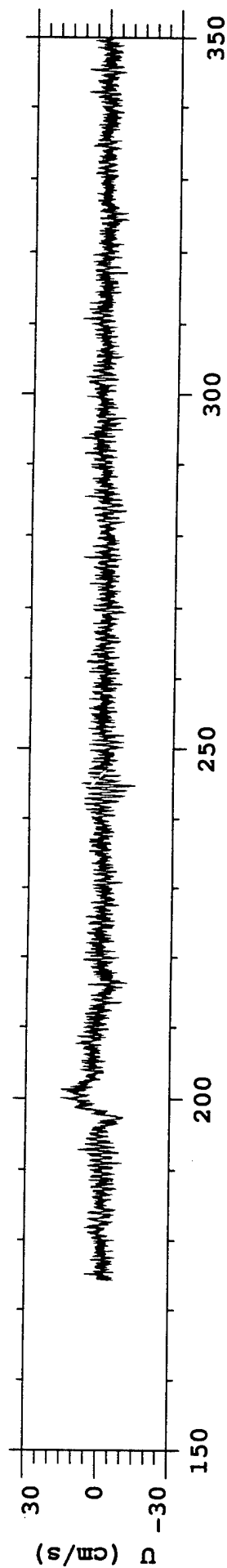
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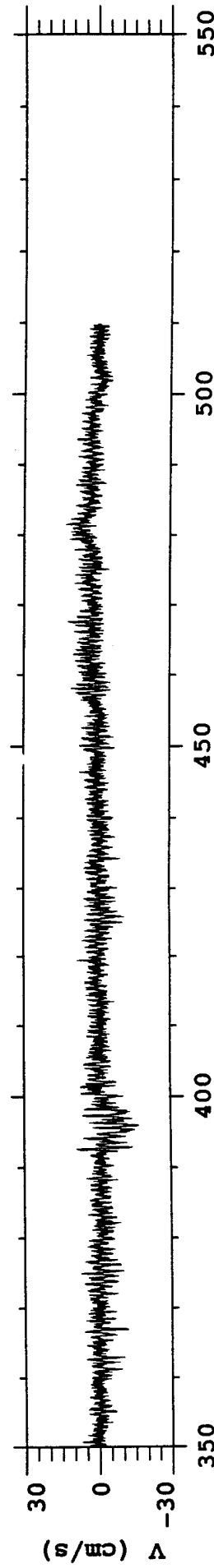
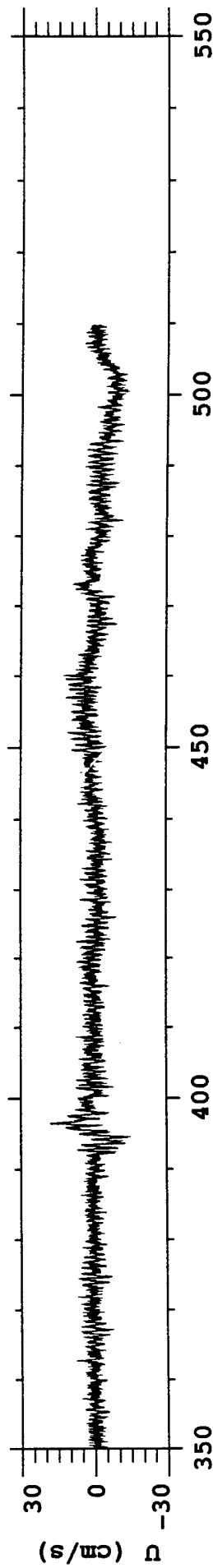
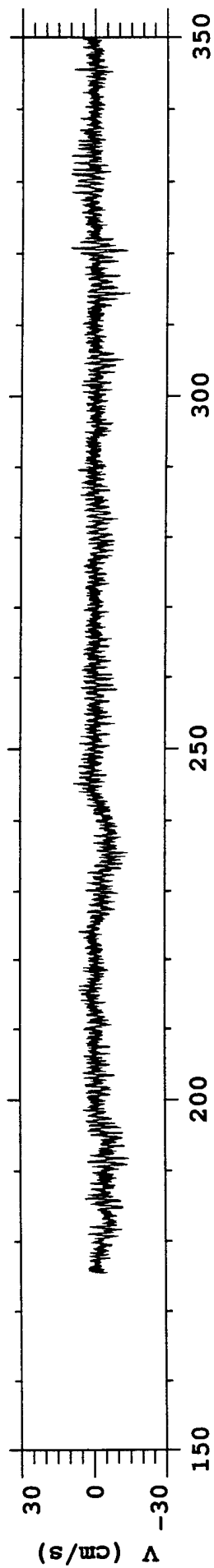
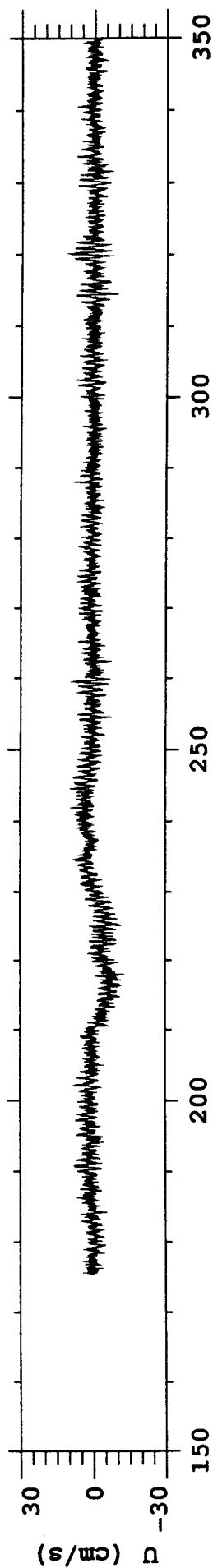
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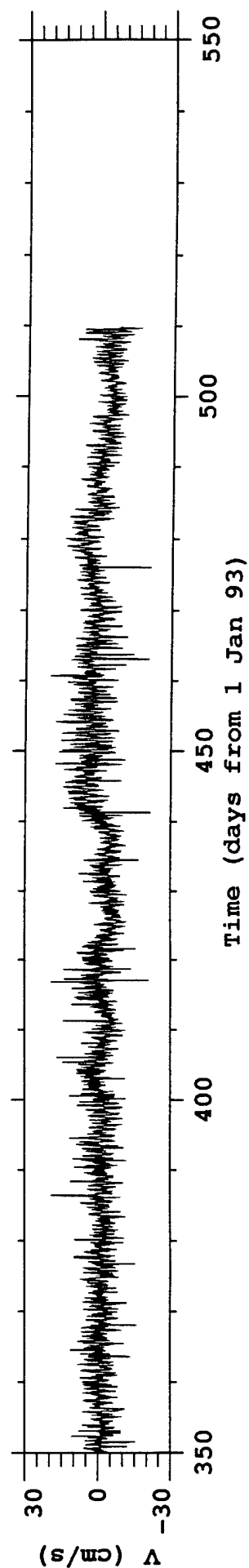
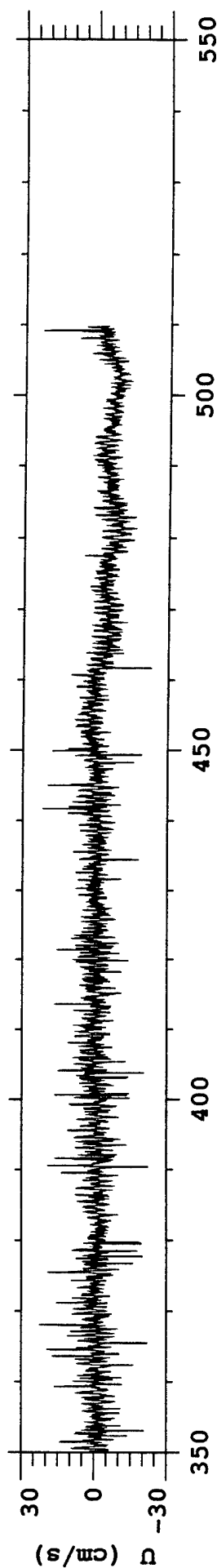
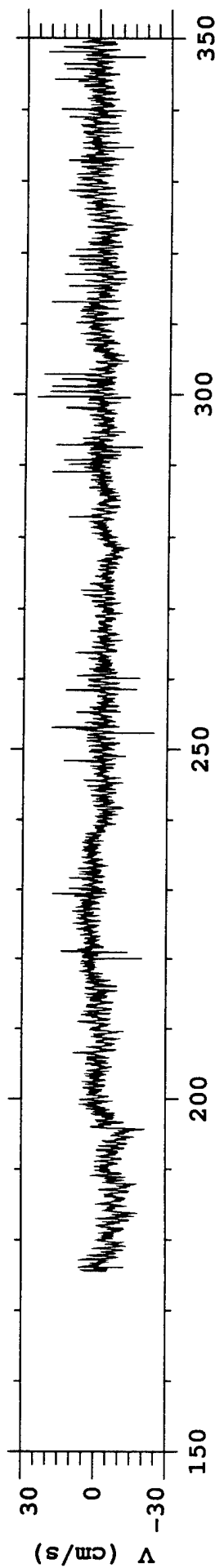
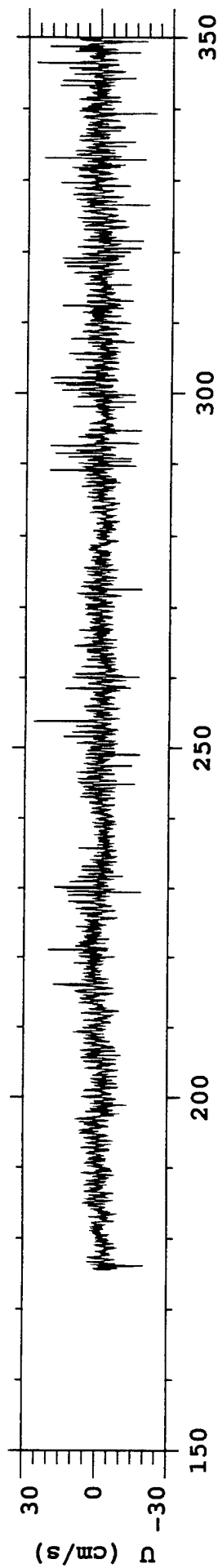


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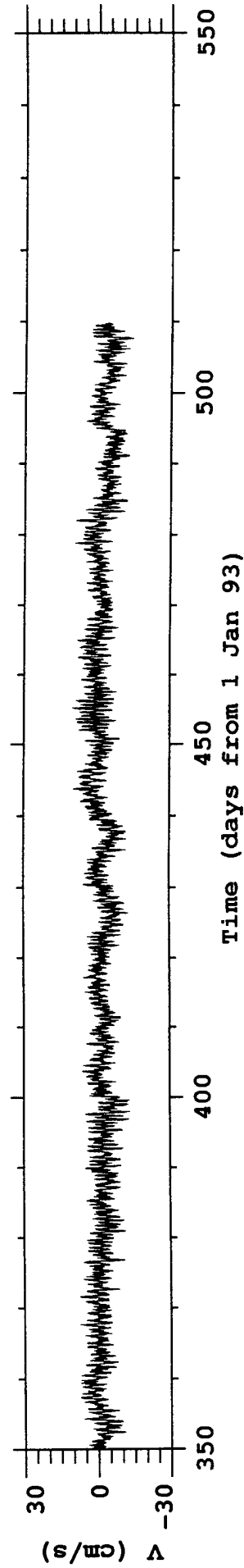
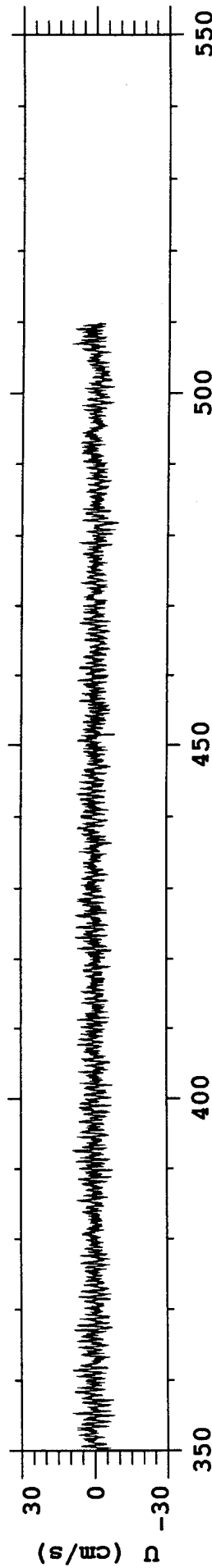
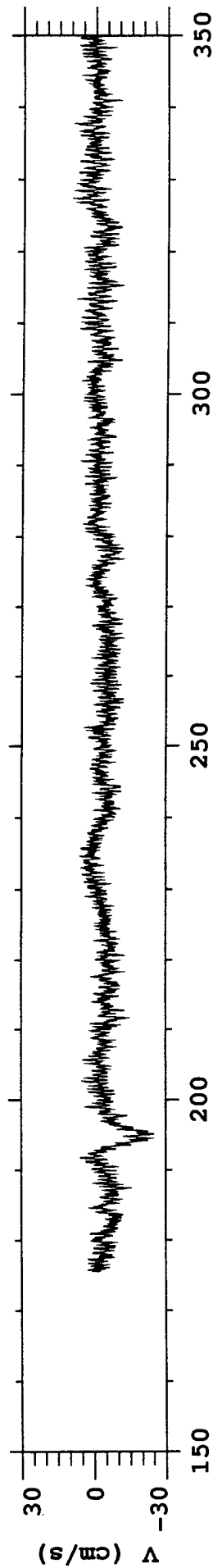
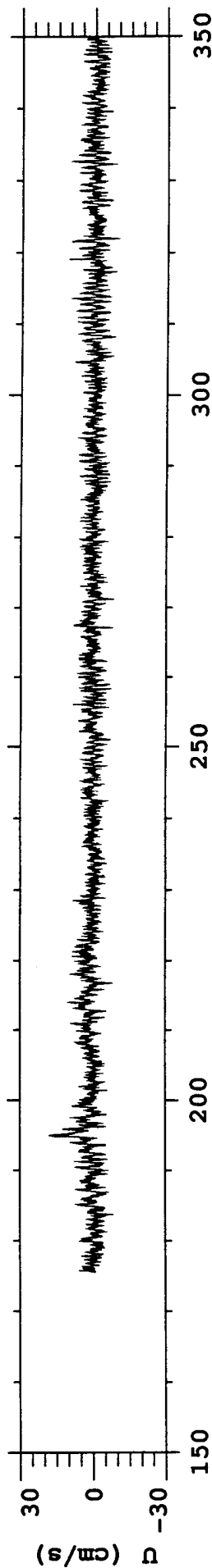


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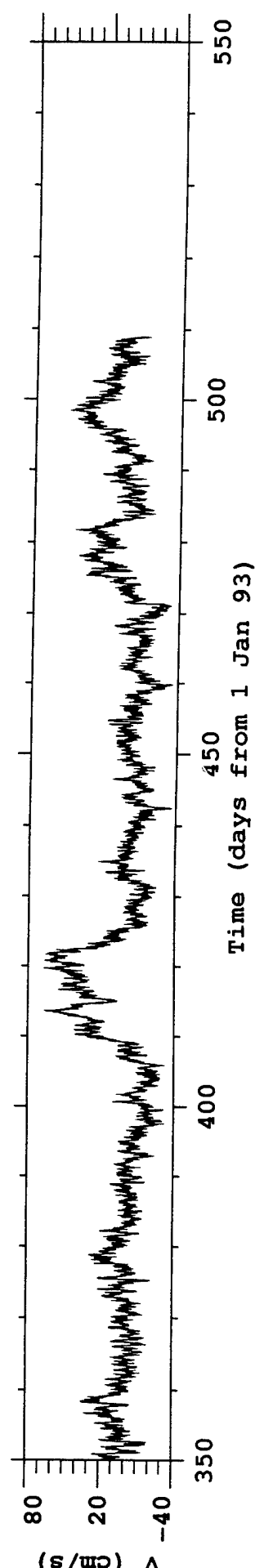
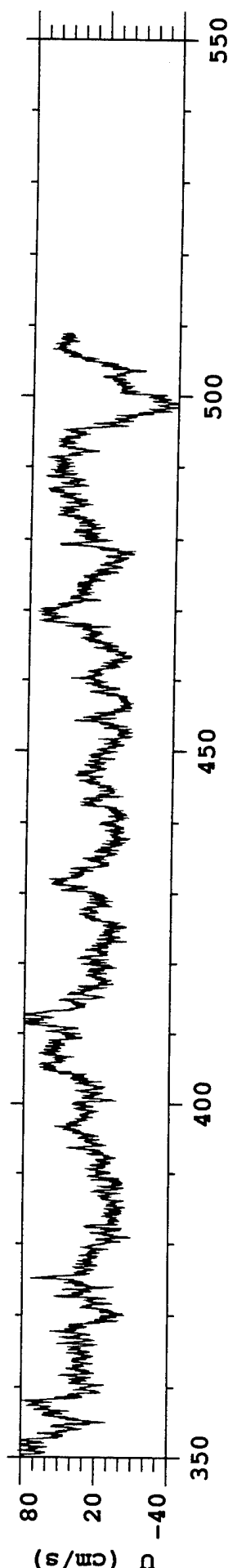
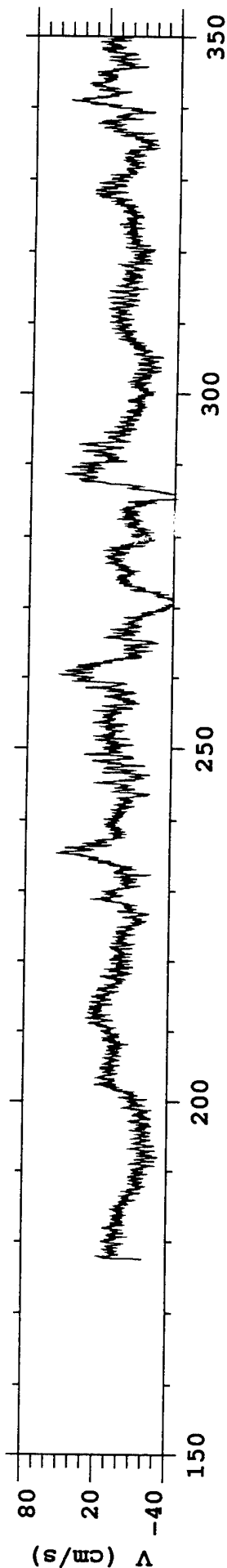
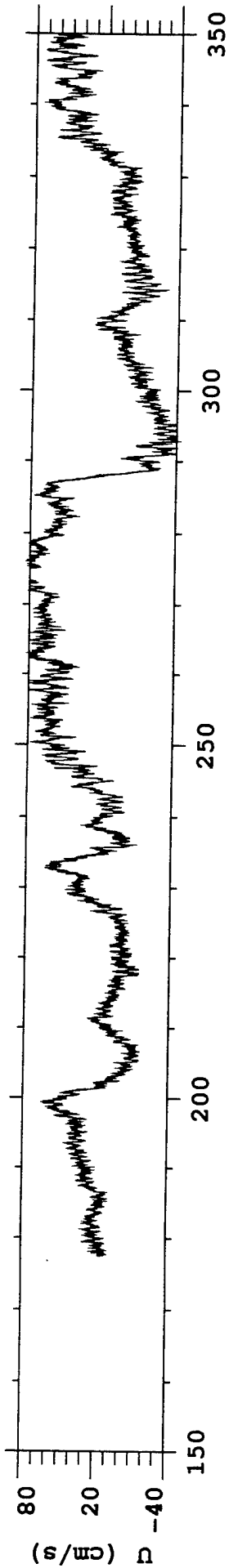
cm93c2-offset



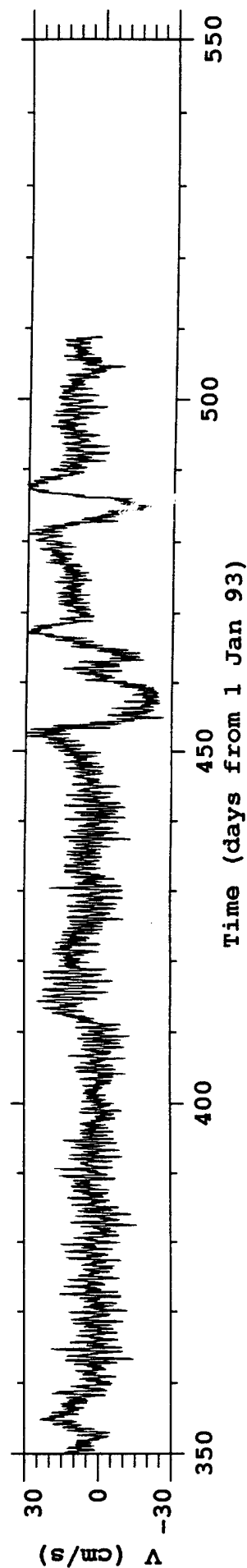
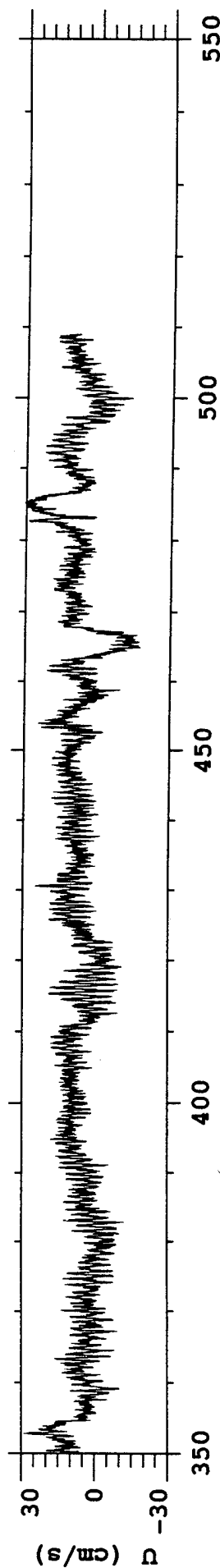
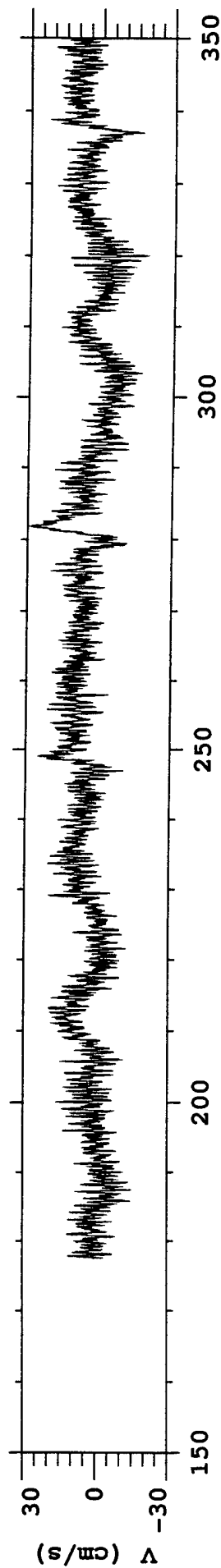
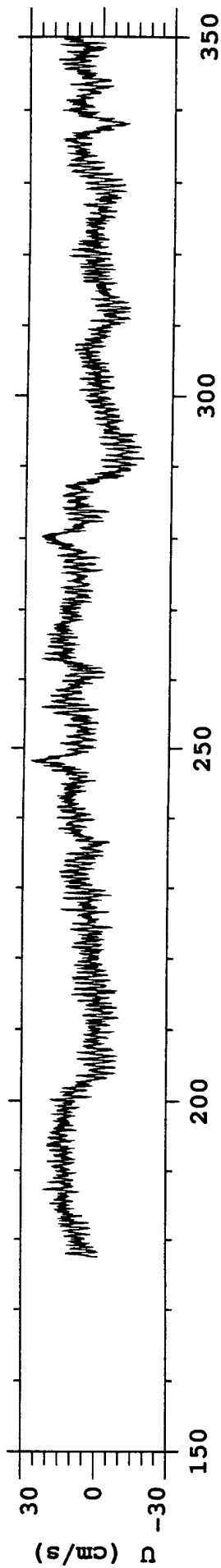
cm93c3-offset



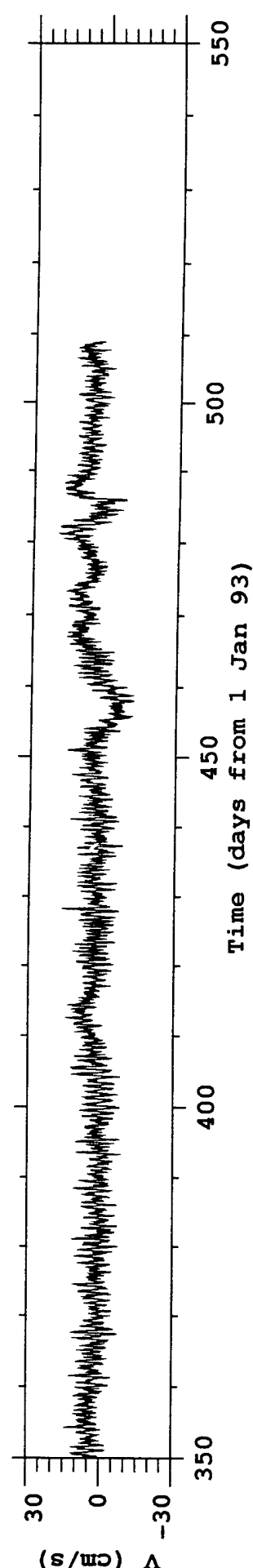
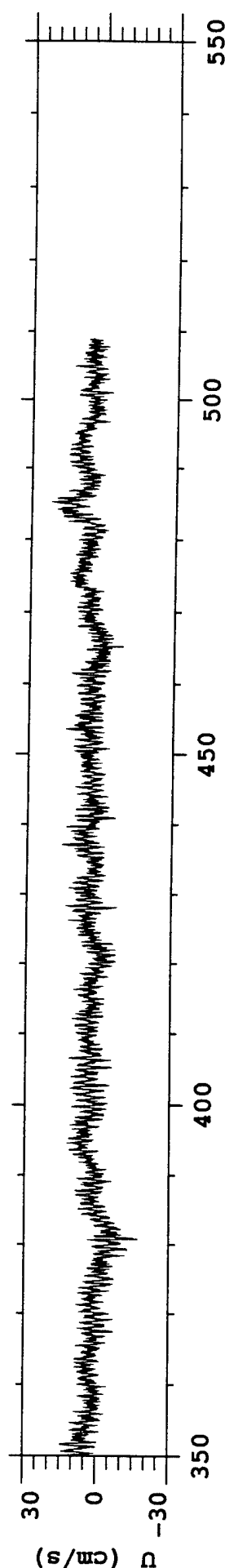
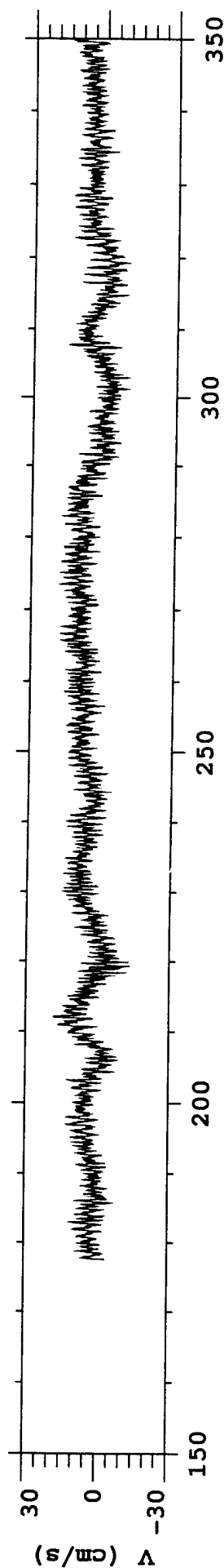
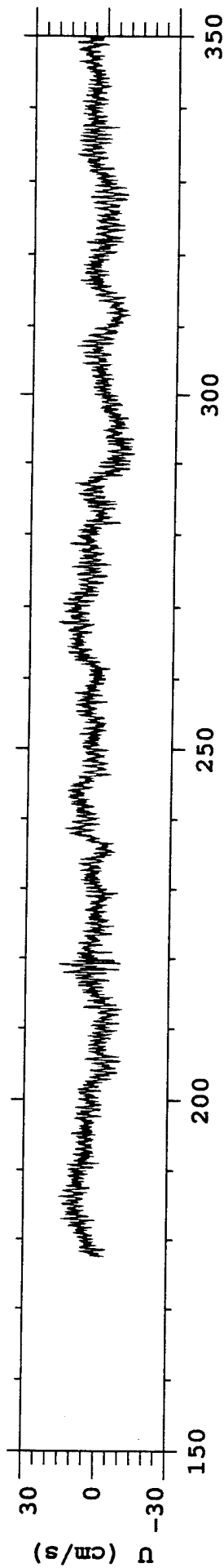
cm93d1-offset



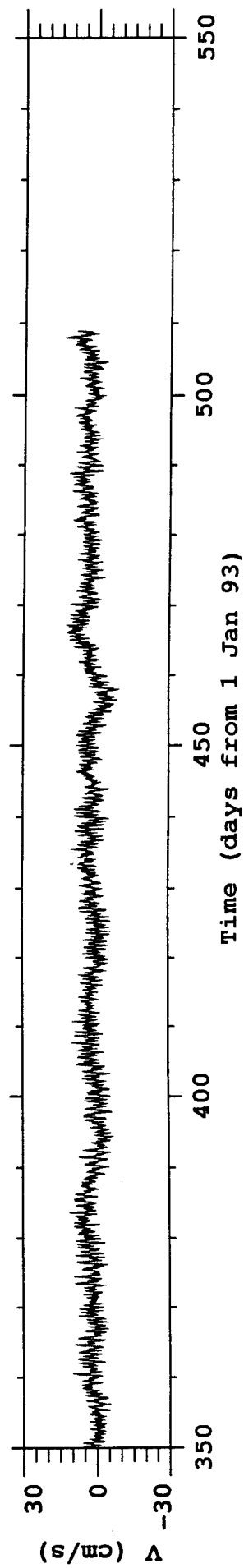
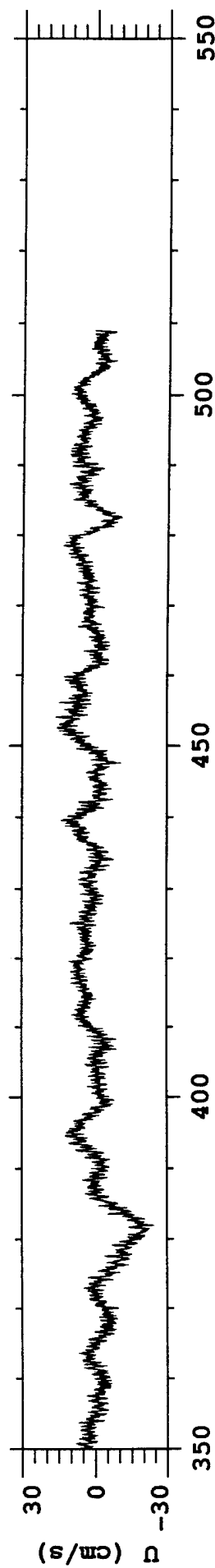
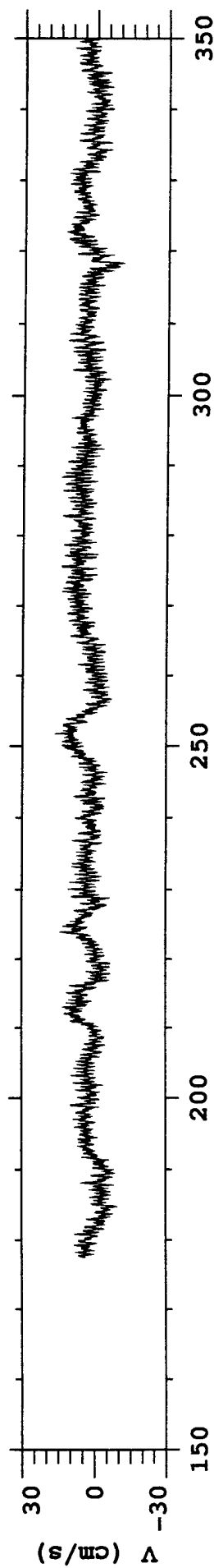
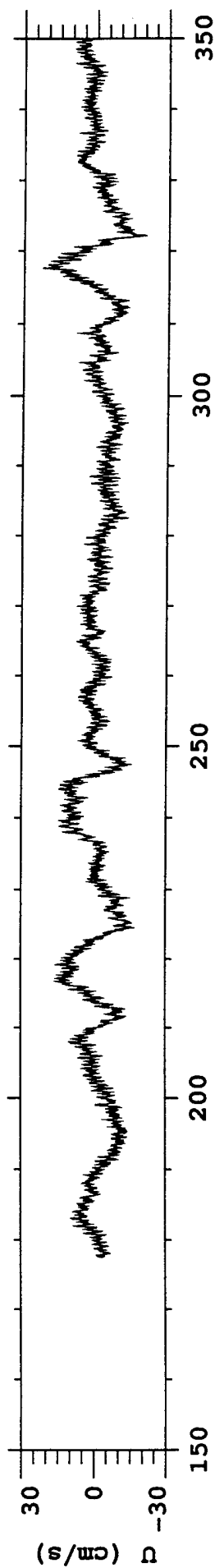
cm93d2-offset



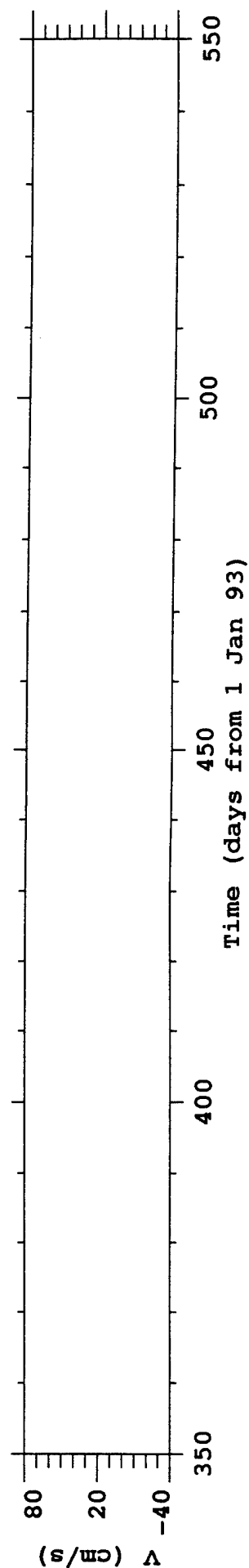
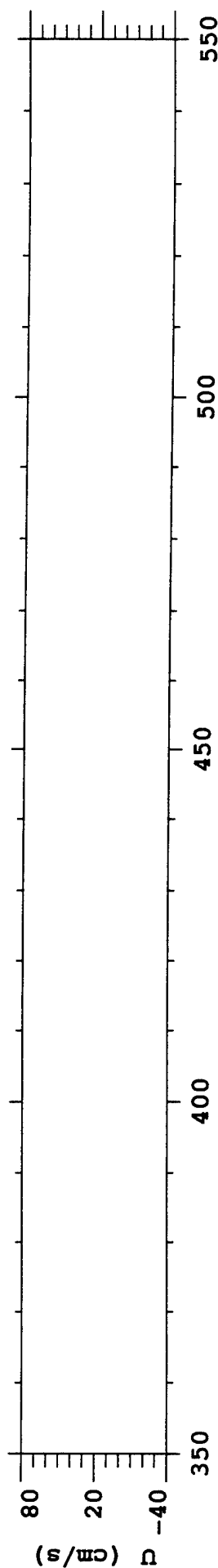
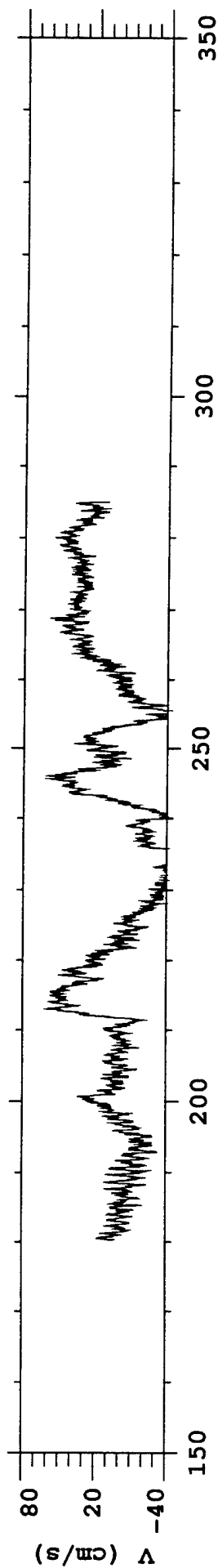
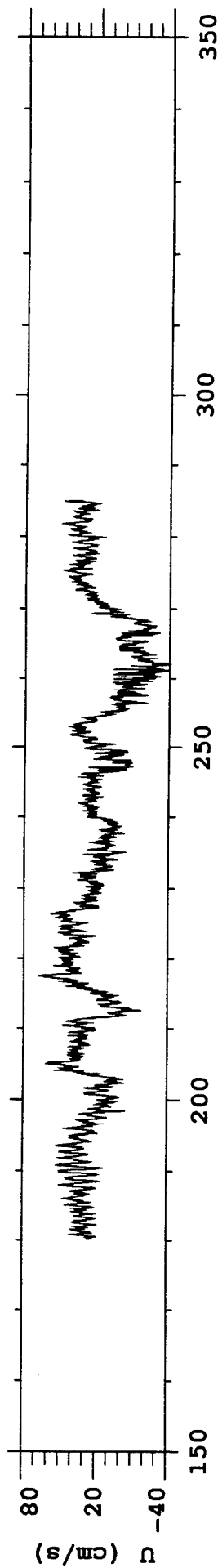
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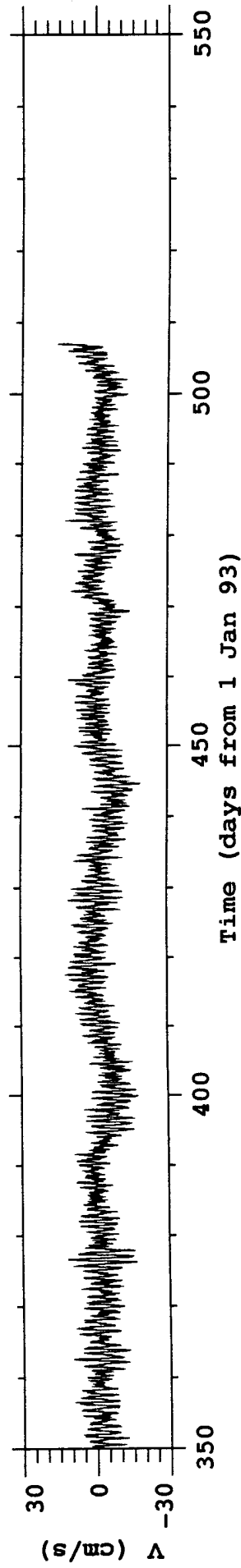
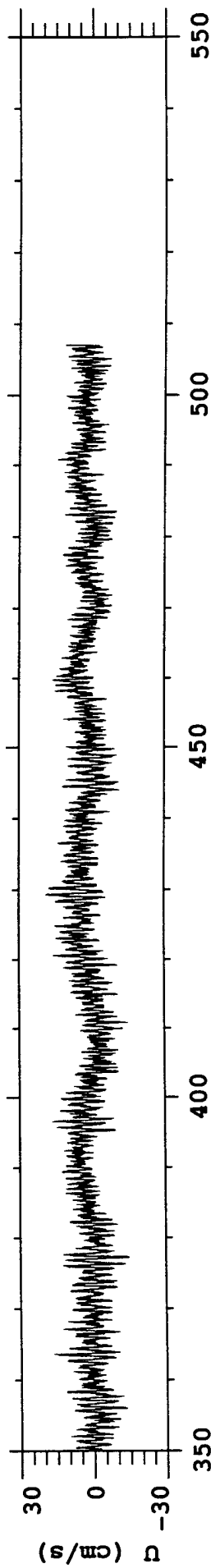
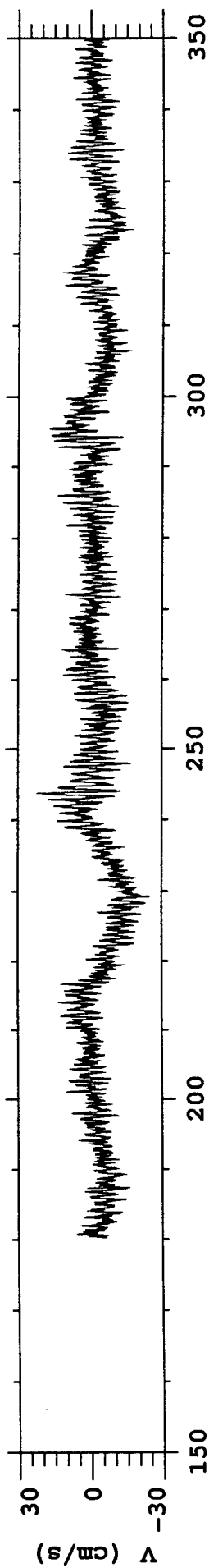
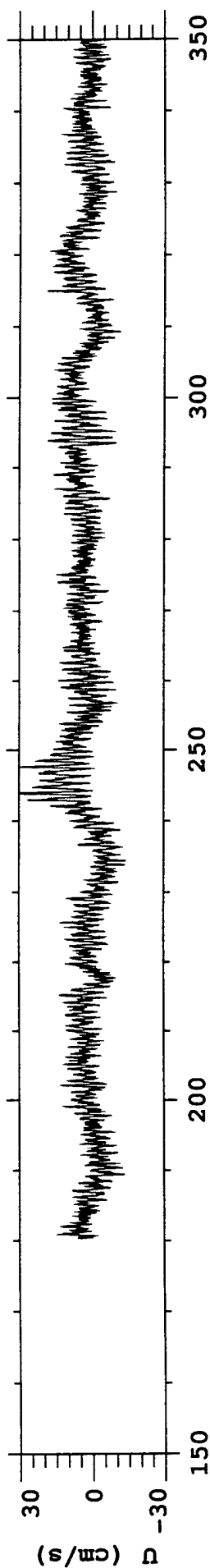
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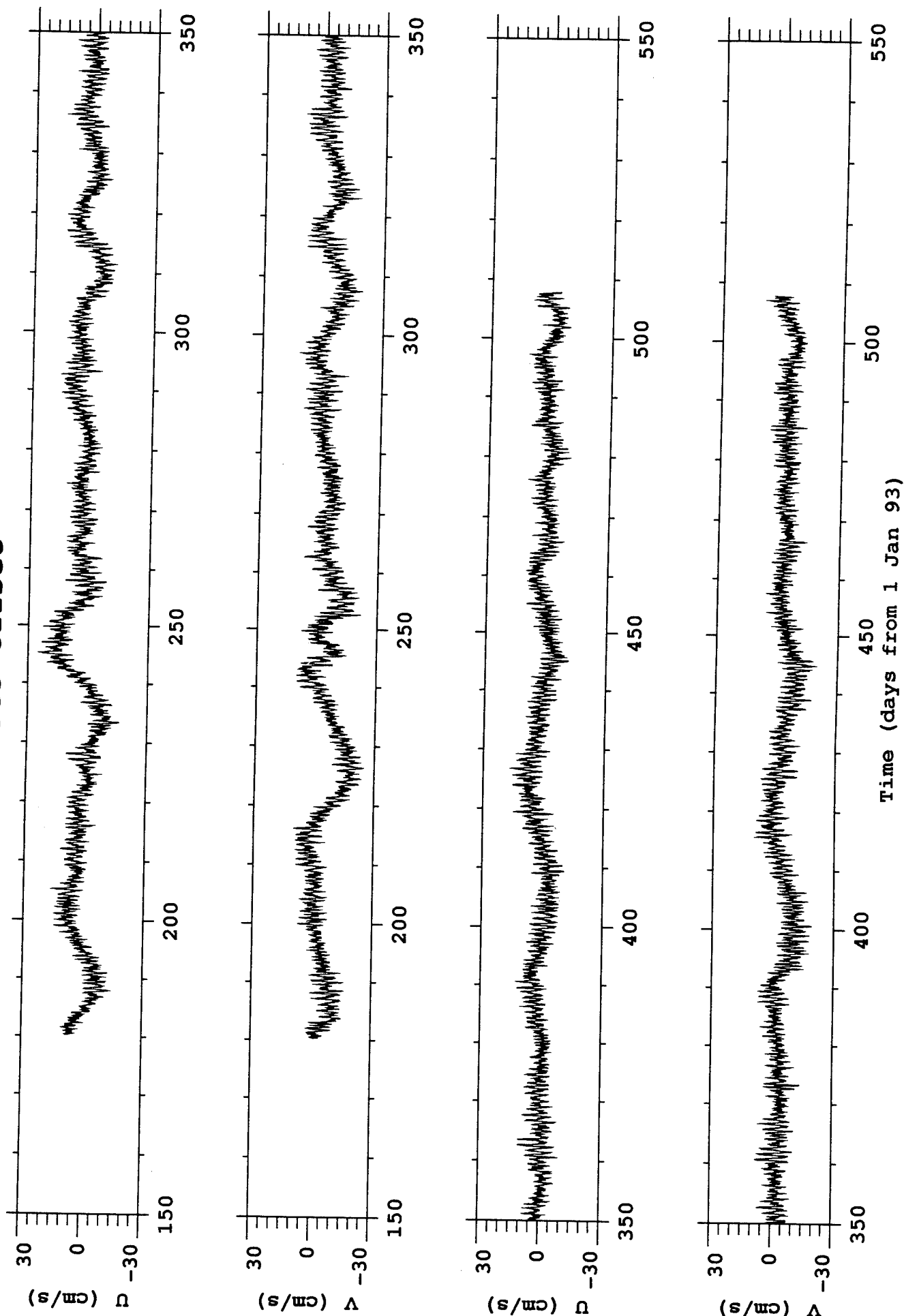
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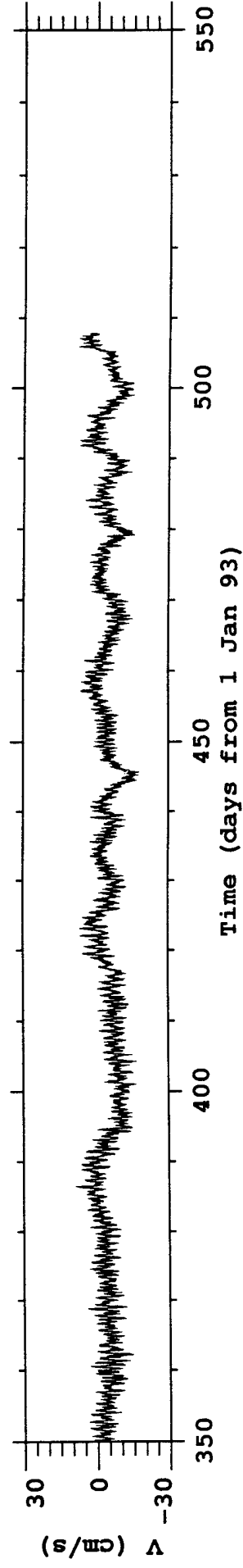
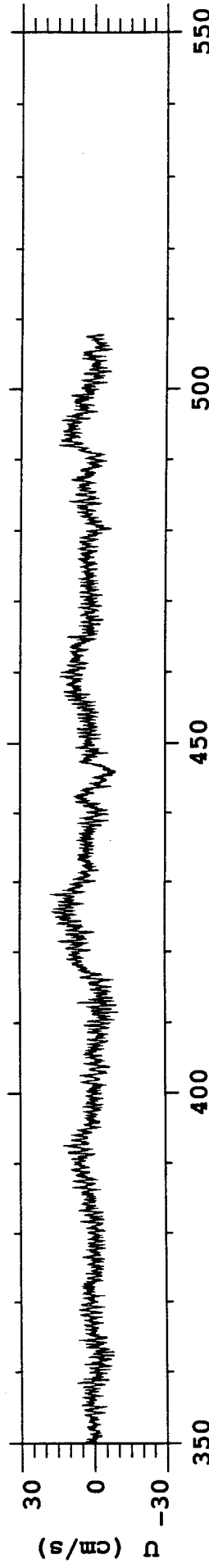
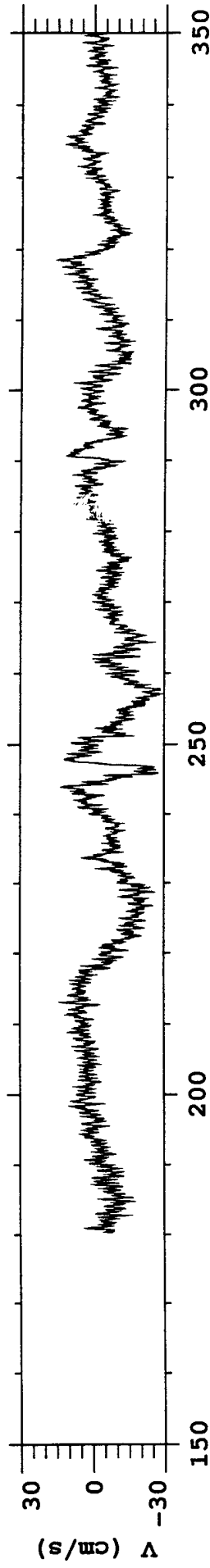
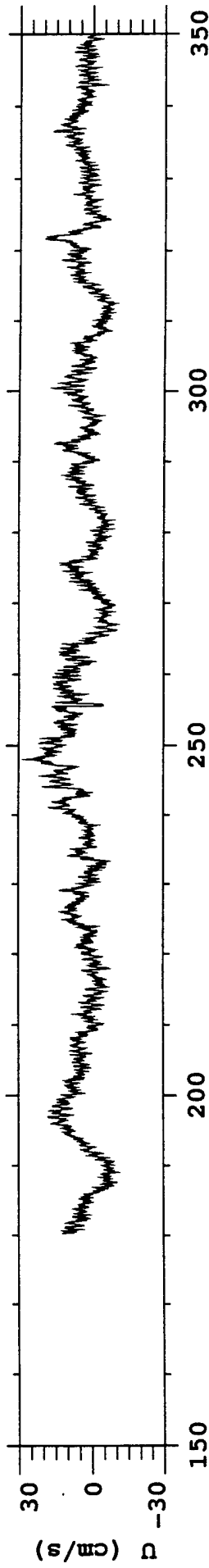
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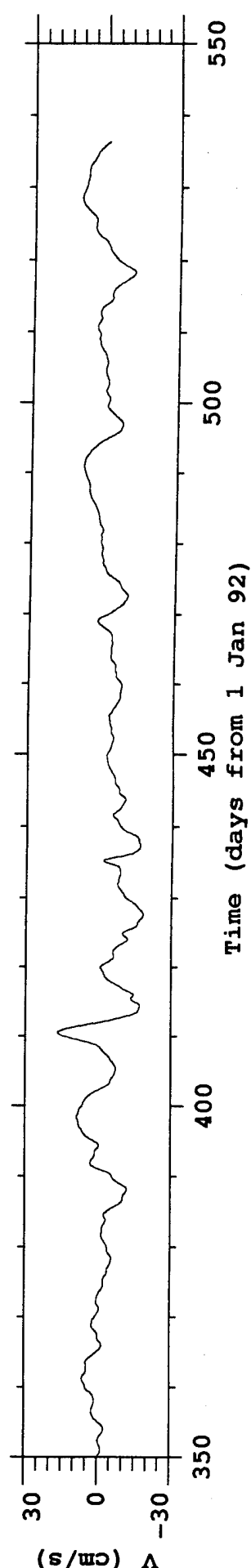
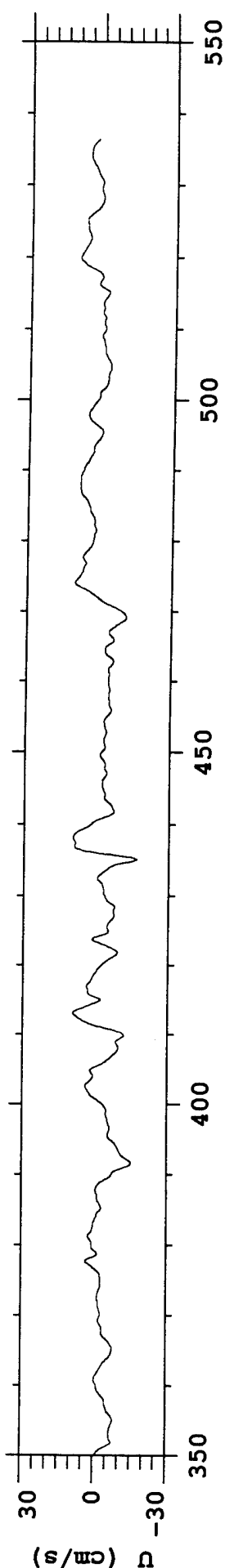
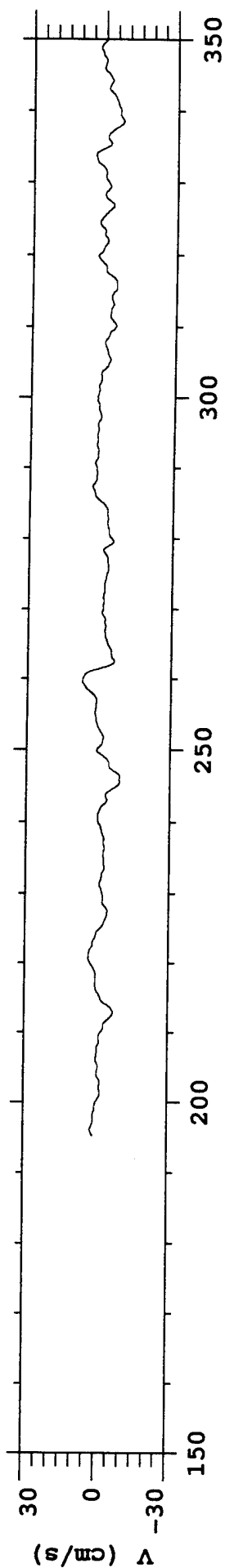
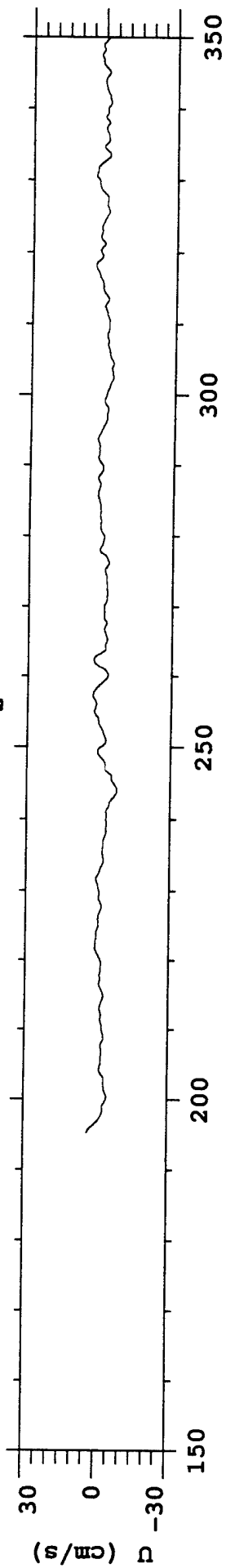
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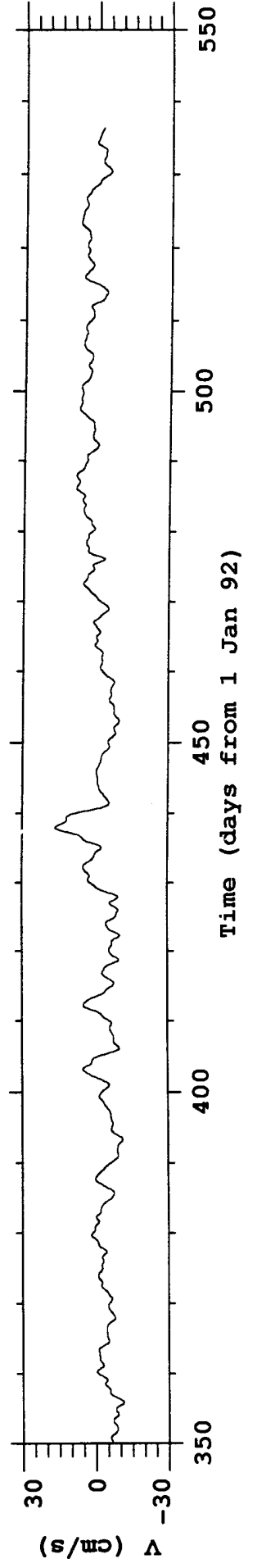
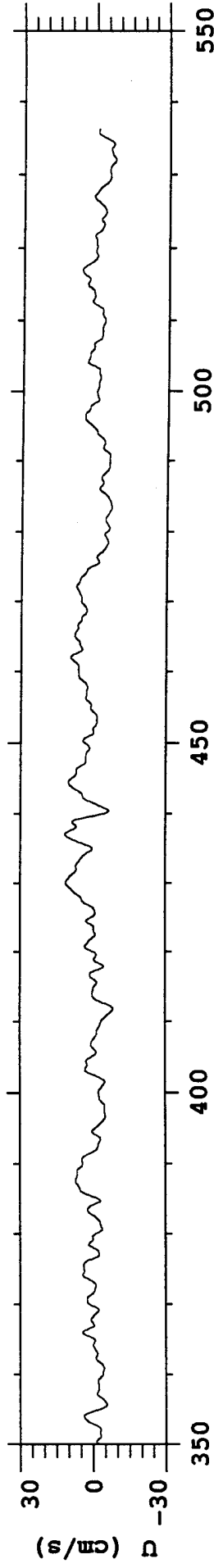
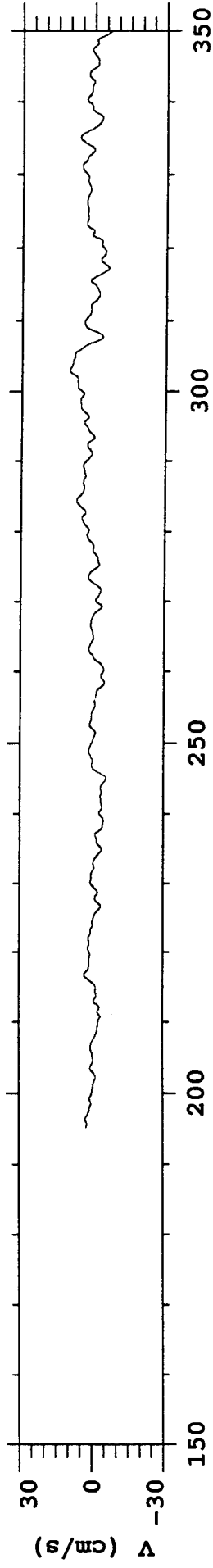
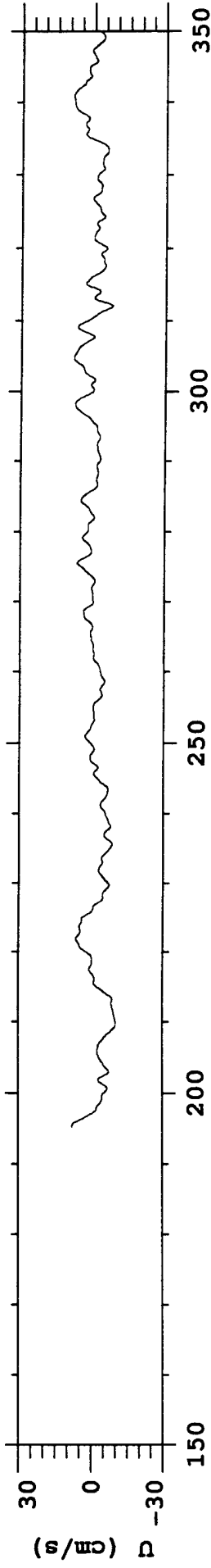
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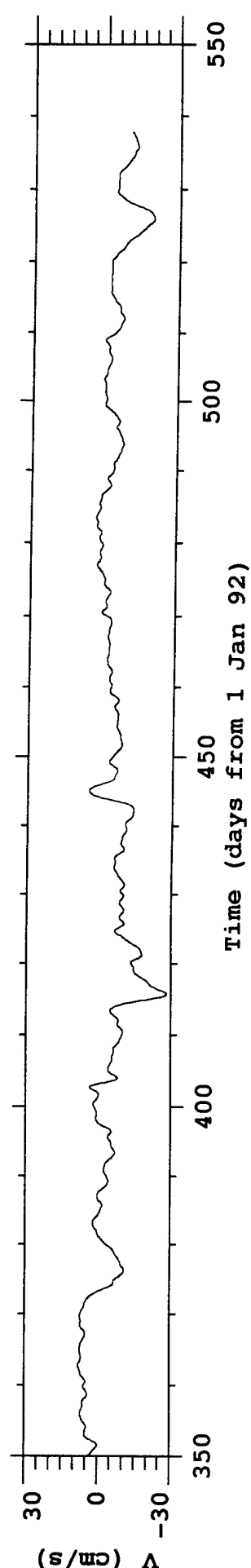
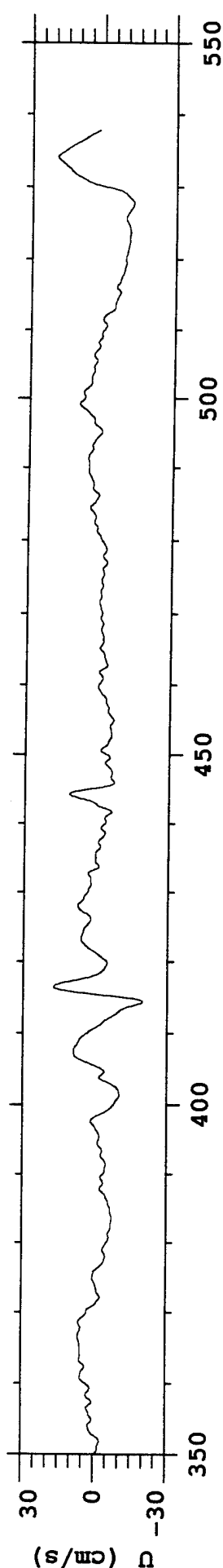
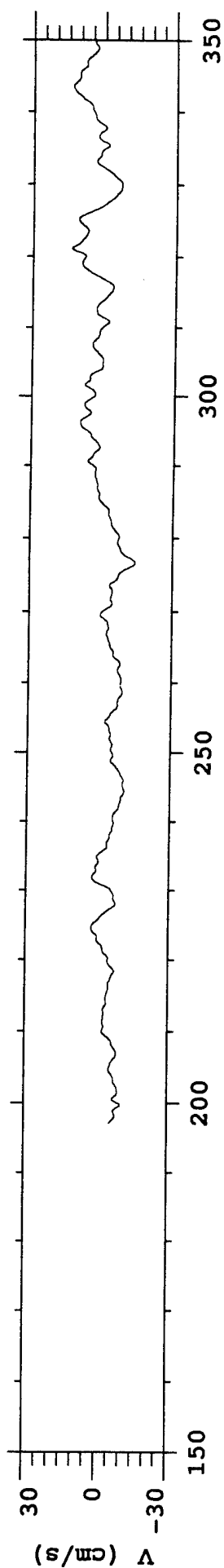
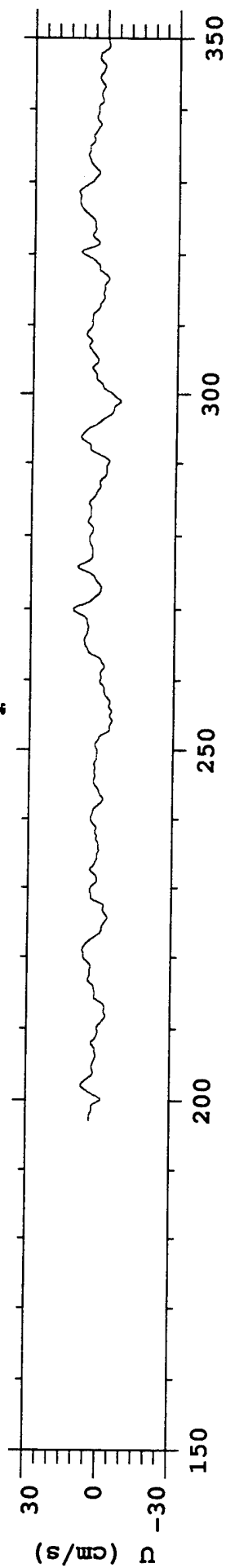
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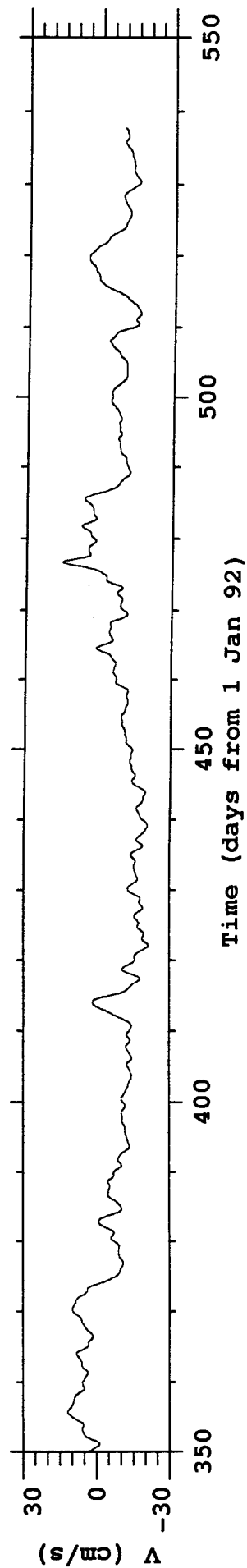
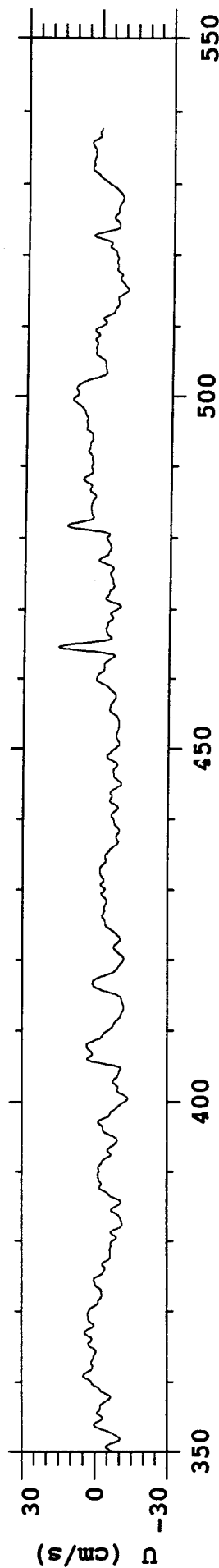
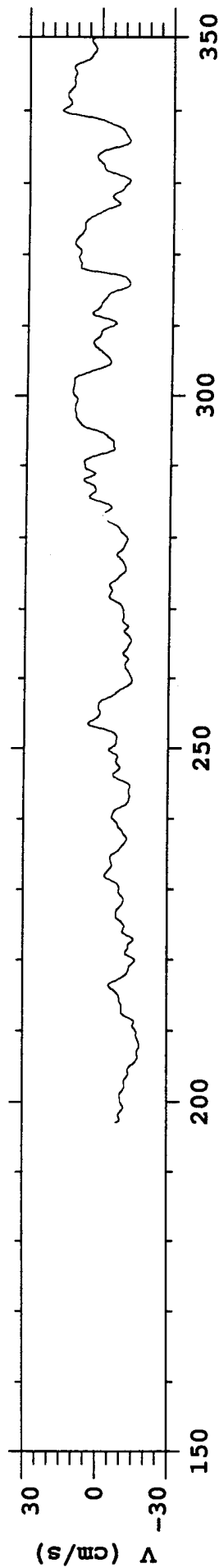
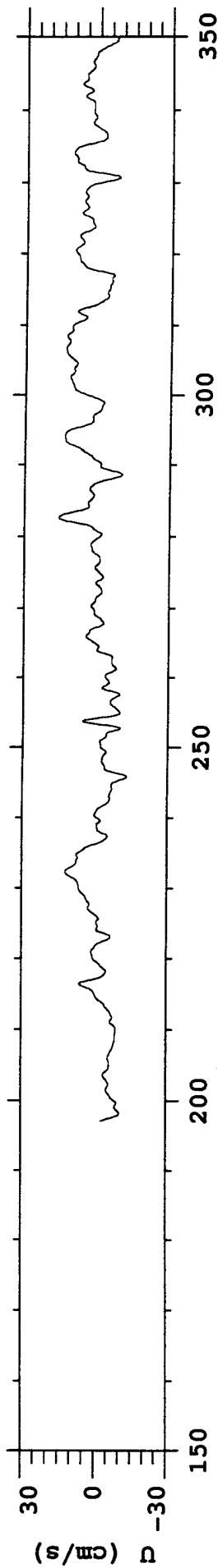


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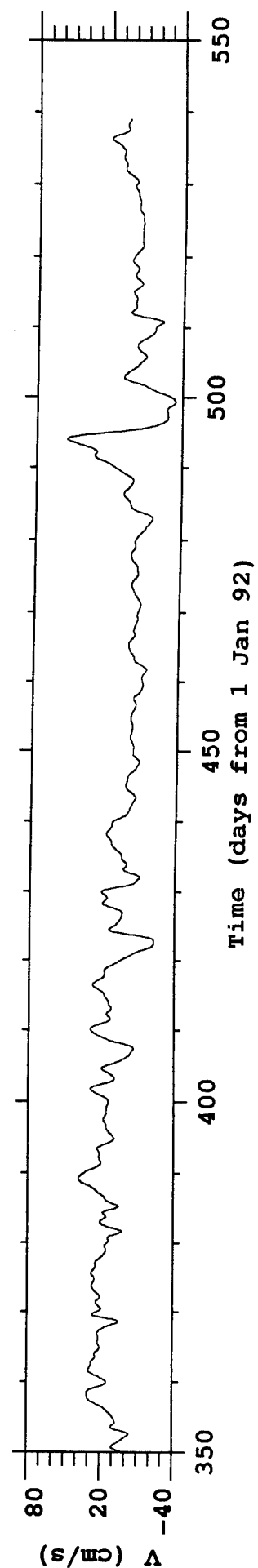
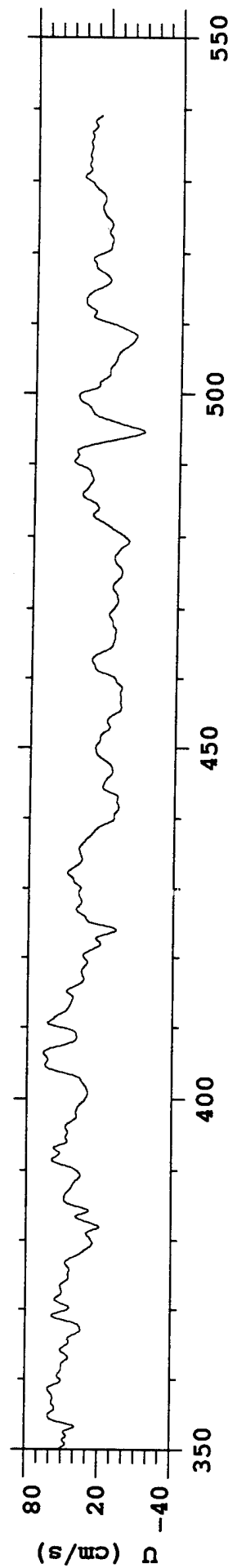
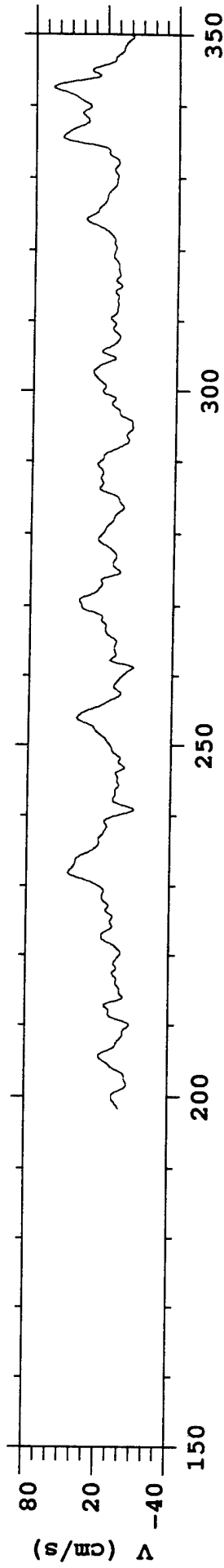
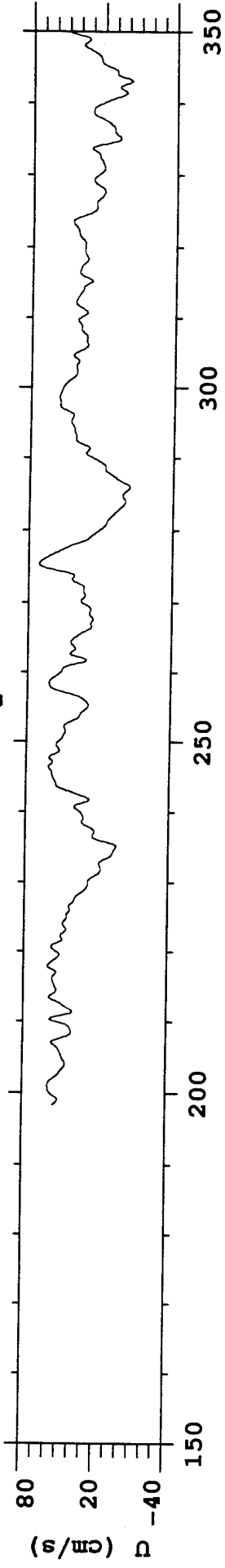


Time (days from 1 Jan 92)

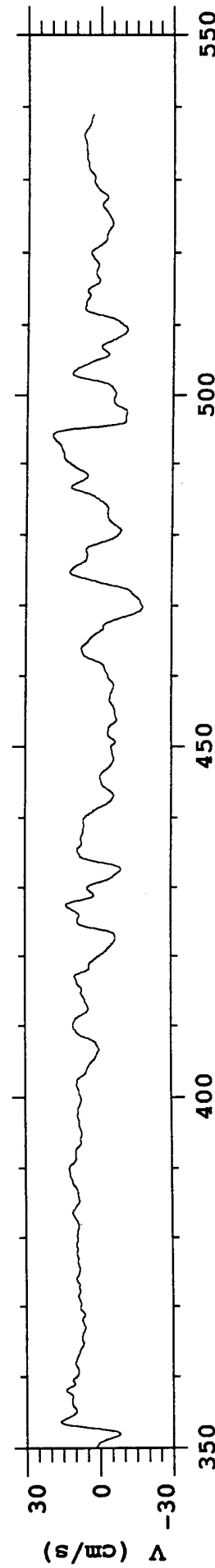
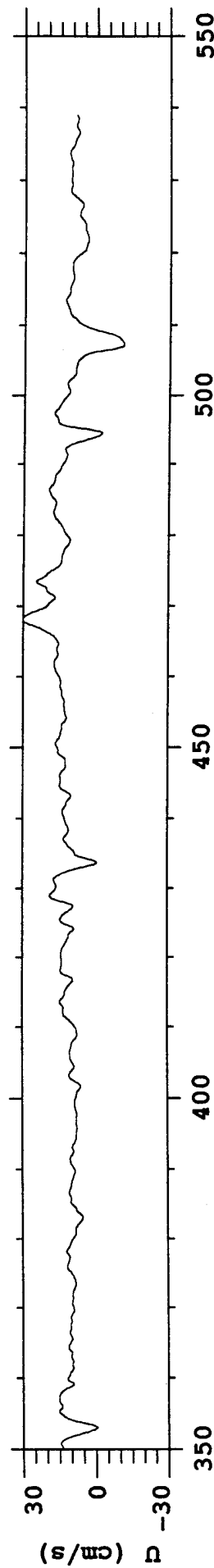
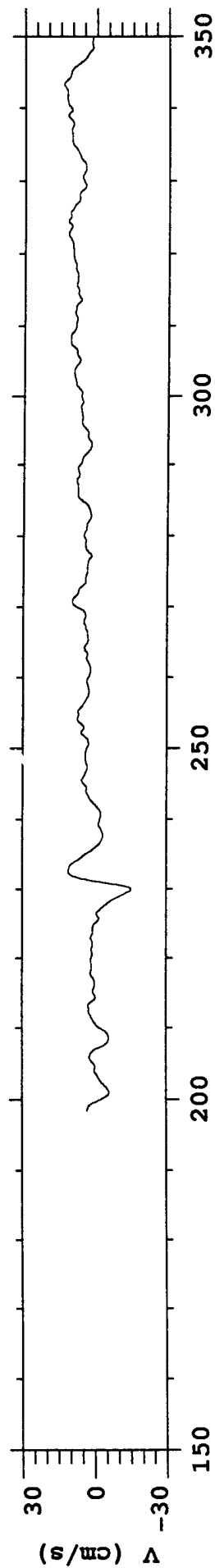
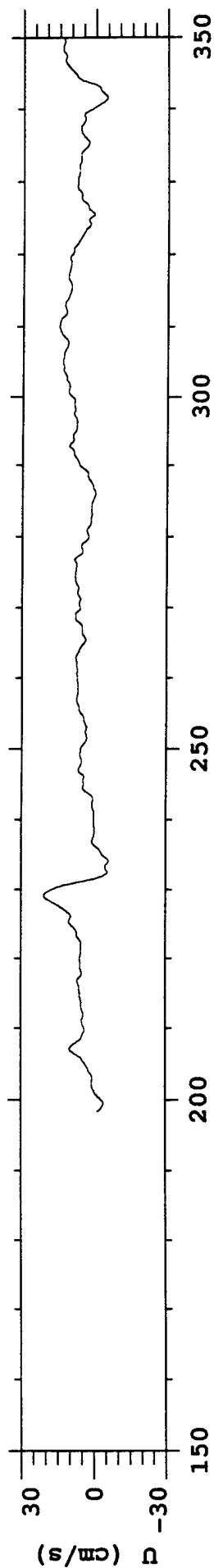
cm92c3-1p



cm92d1-1p

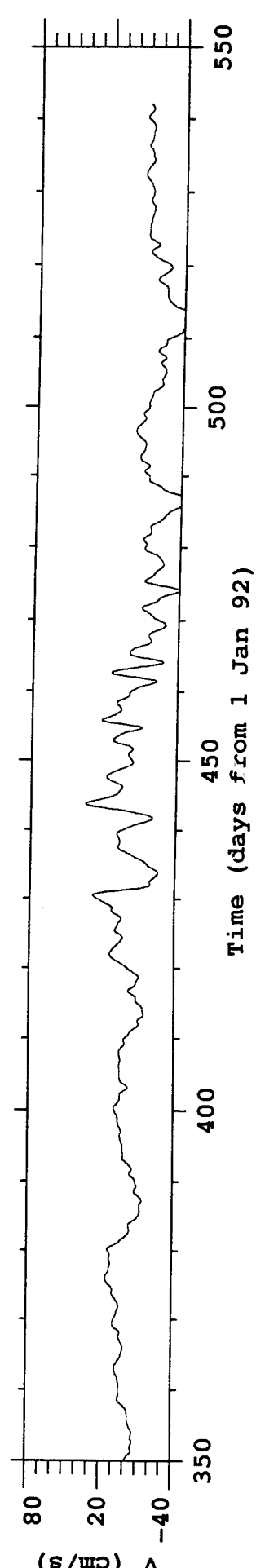
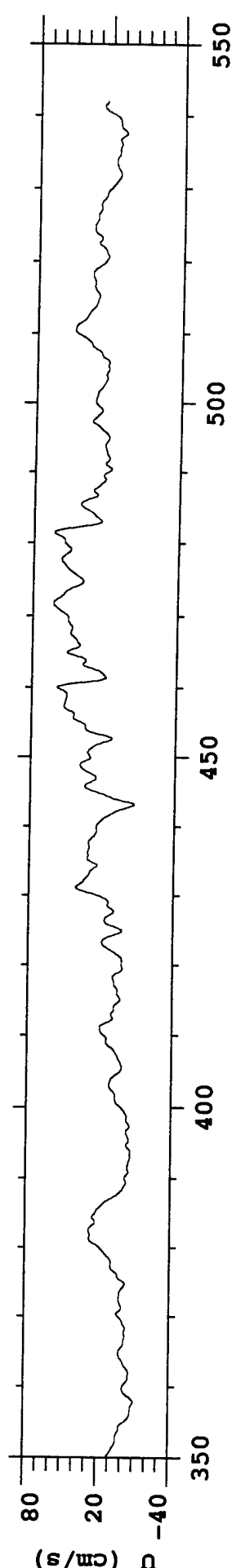
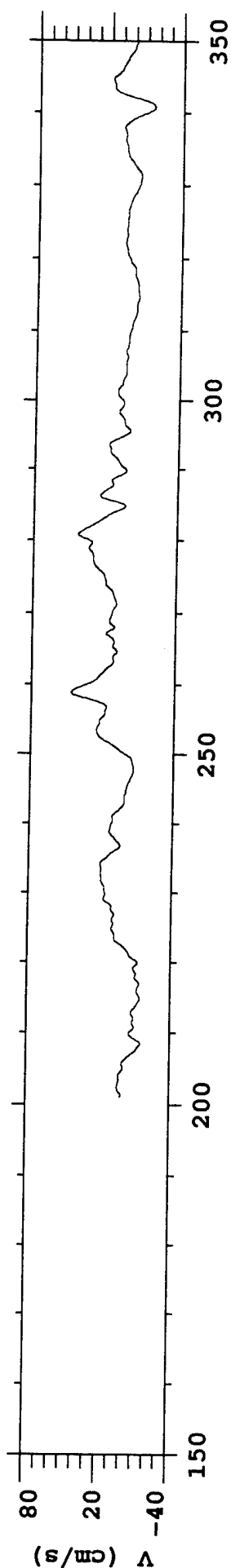
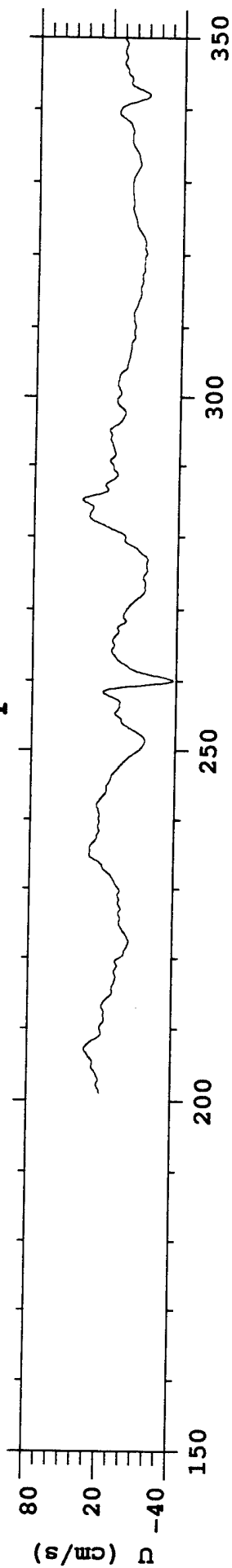


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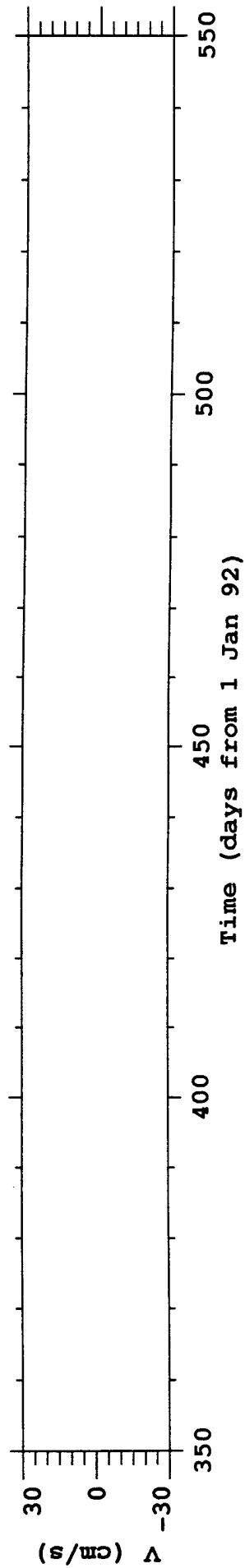
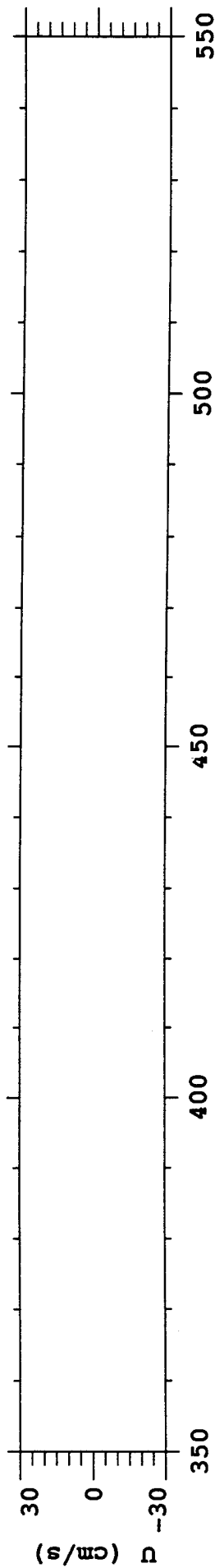
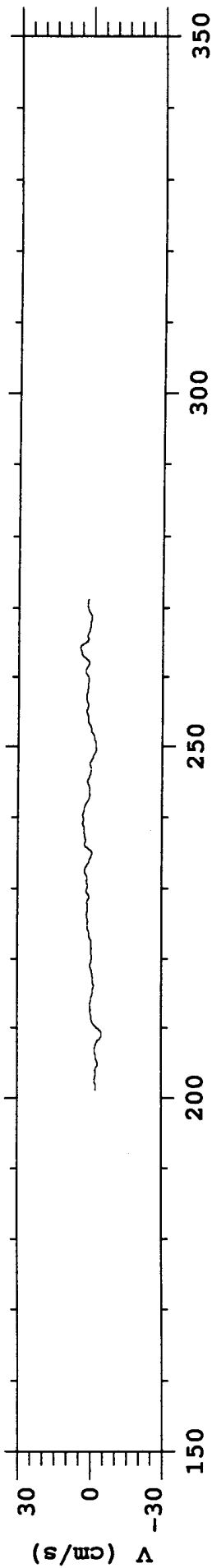
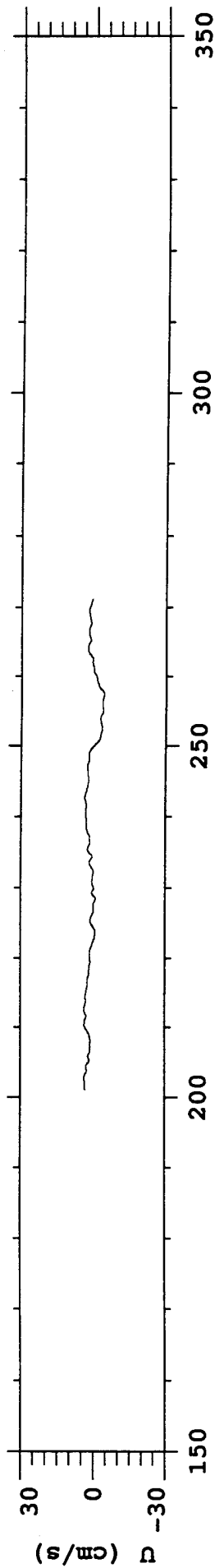


Time (days from 1 Jan 92)

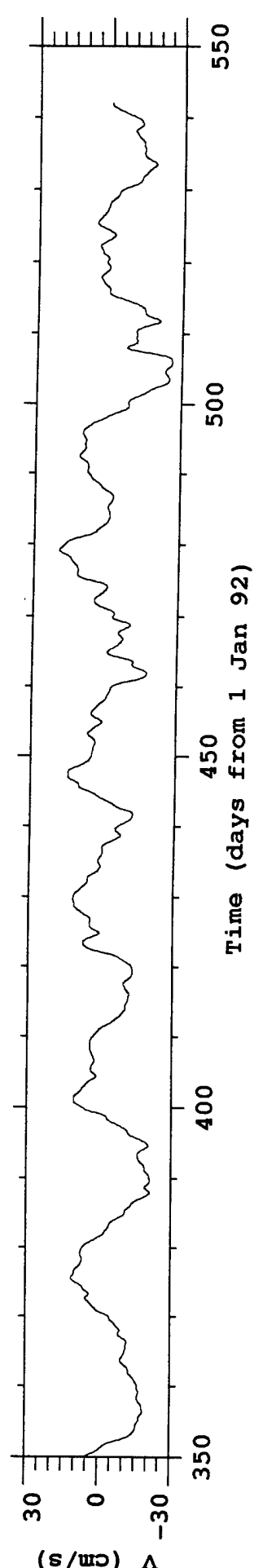
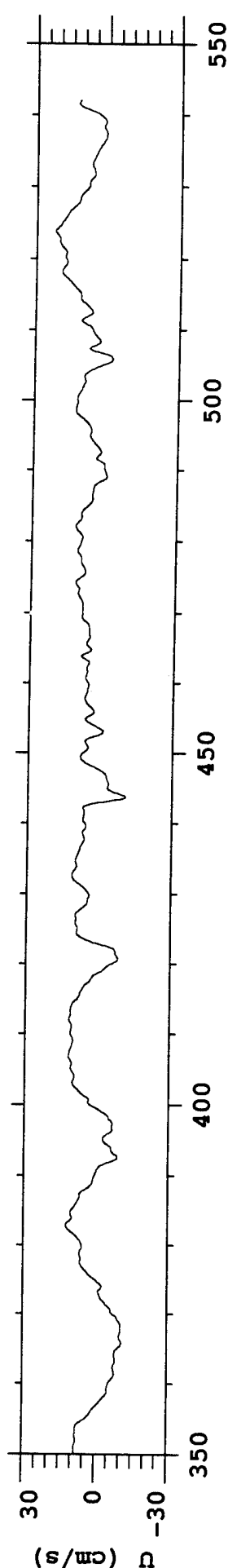
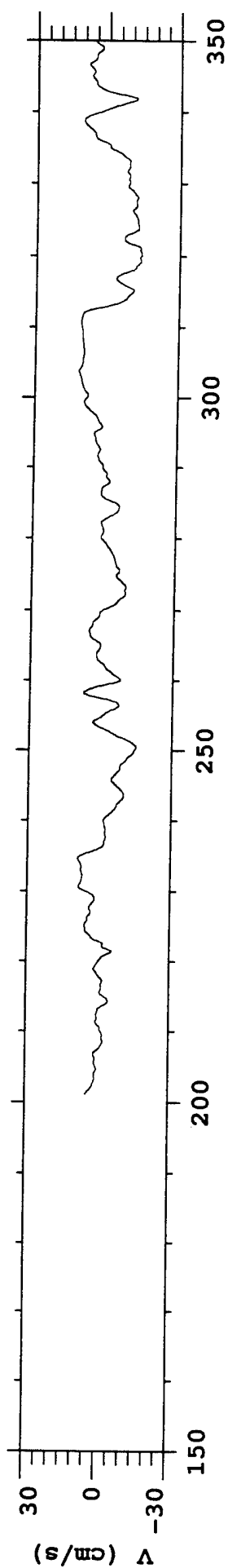
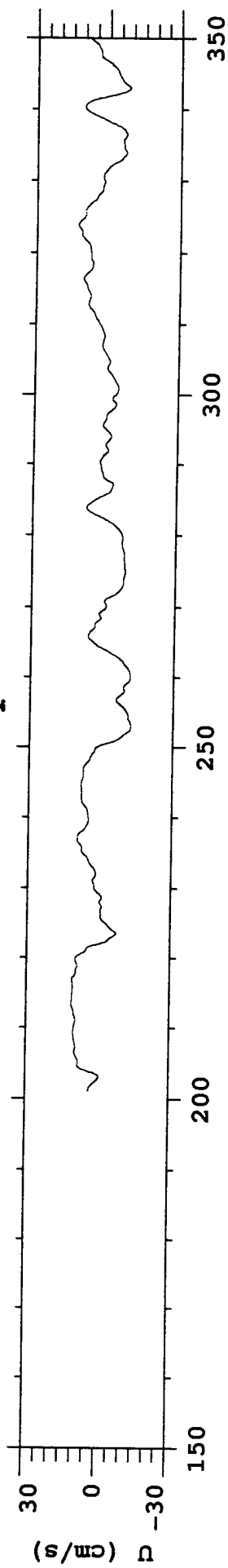
cm92e1-1p



cm92e2-1p

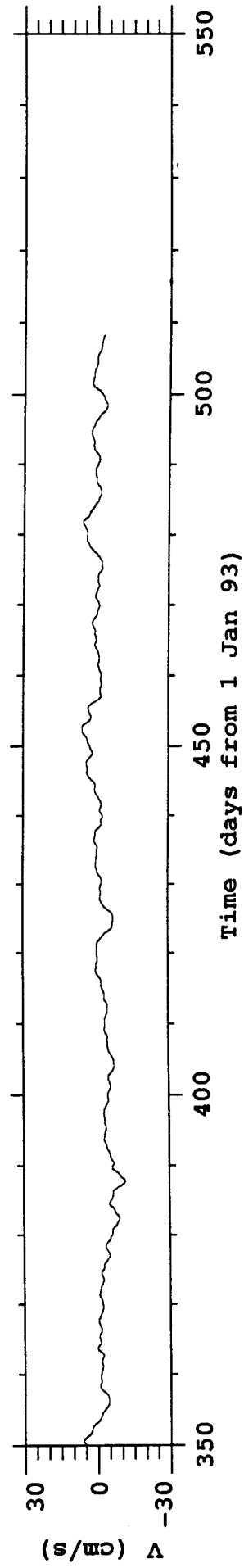
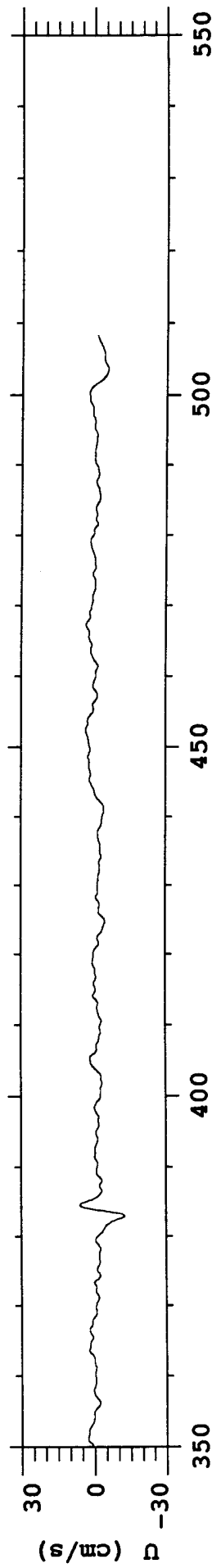
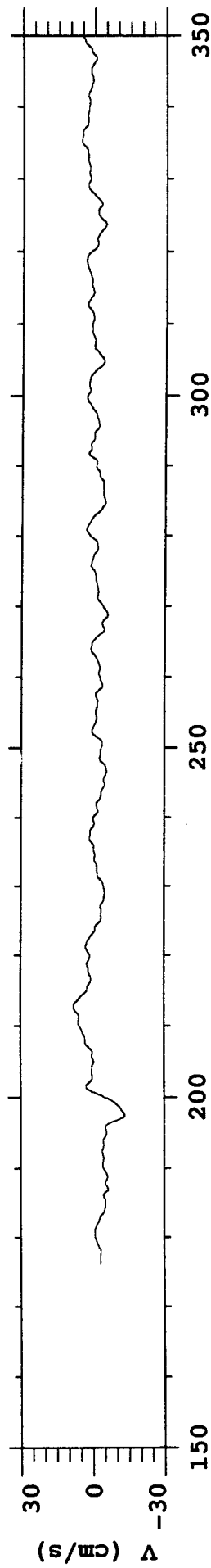
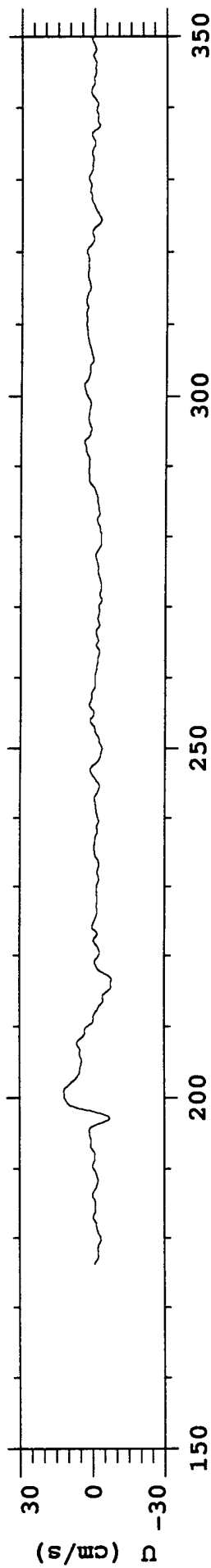


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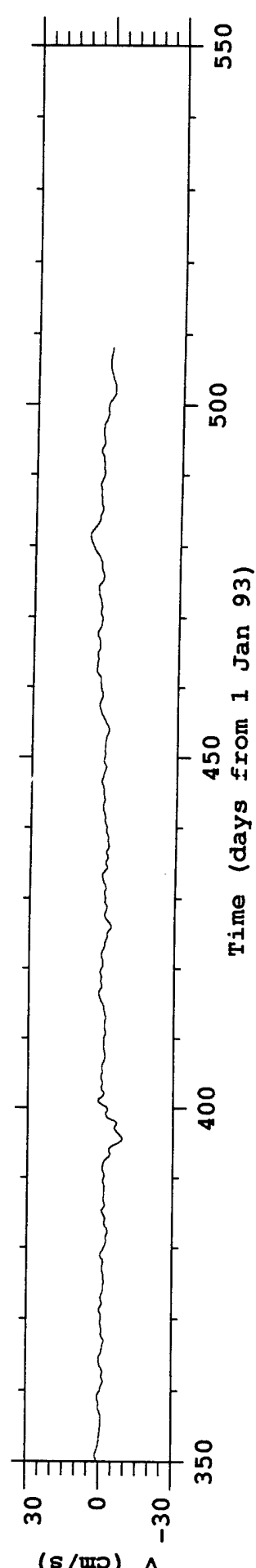
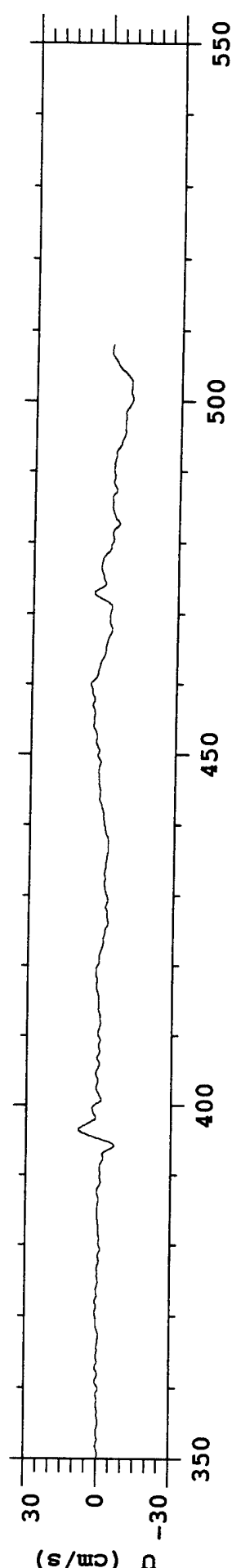
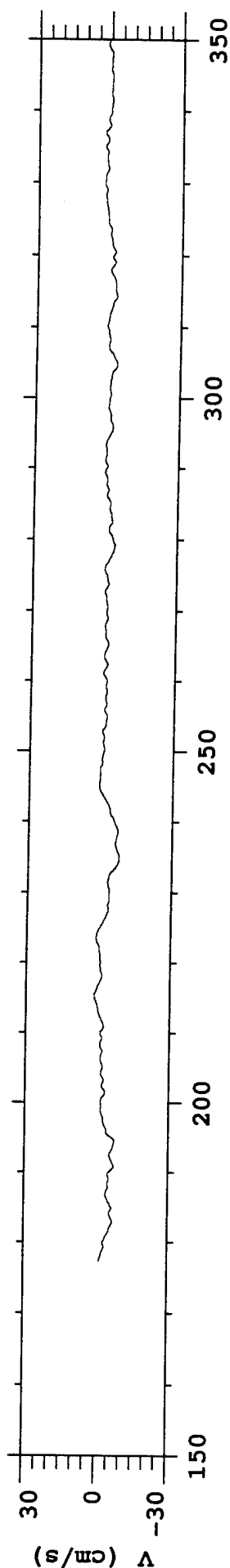
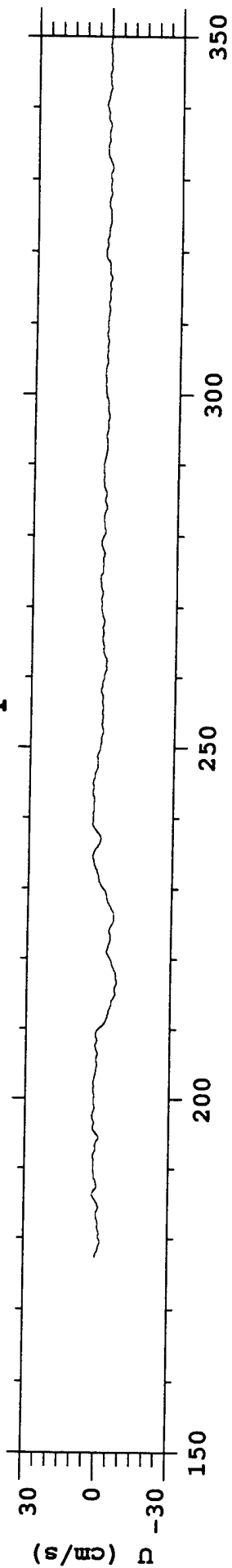


Time (days from 1 Jan 92)

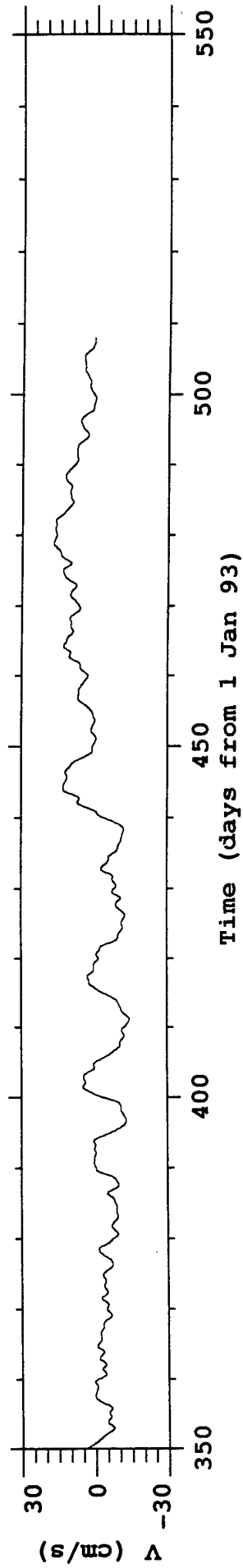
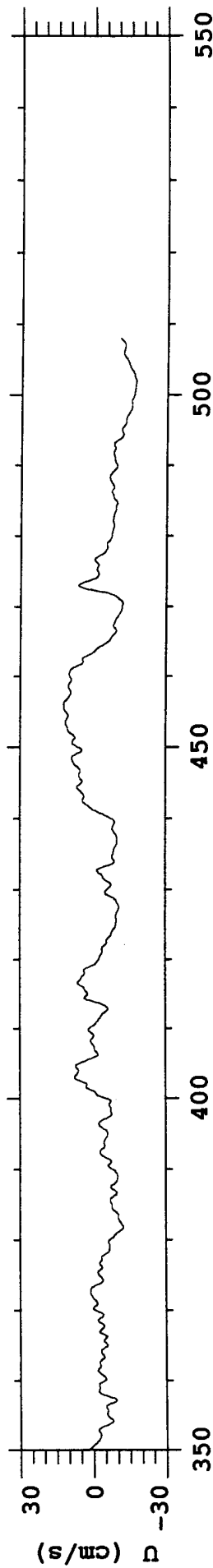
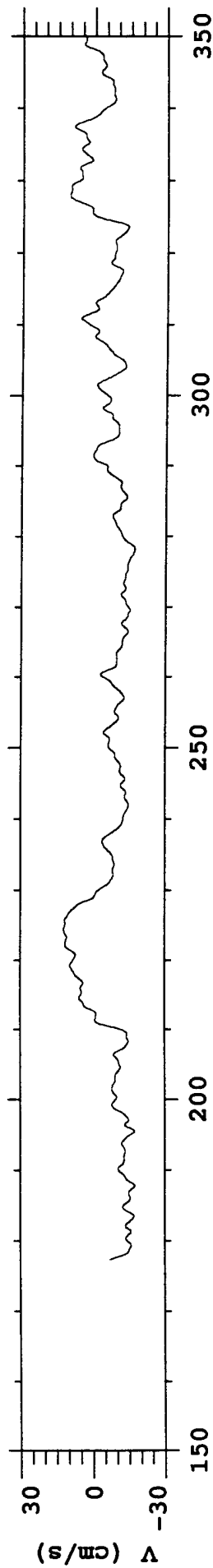
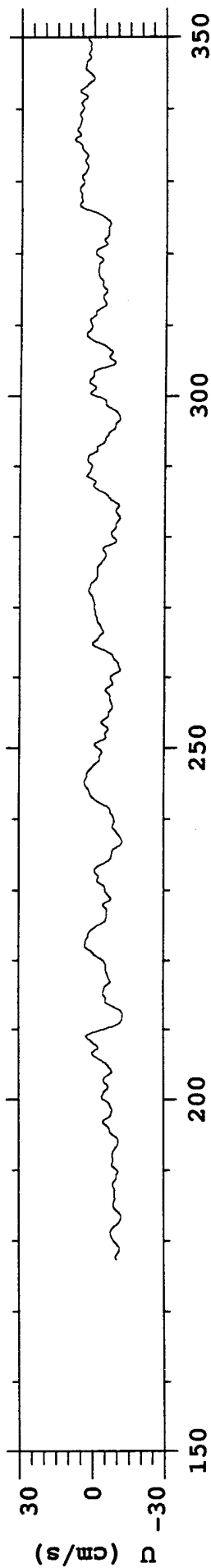
cm93b1-1p



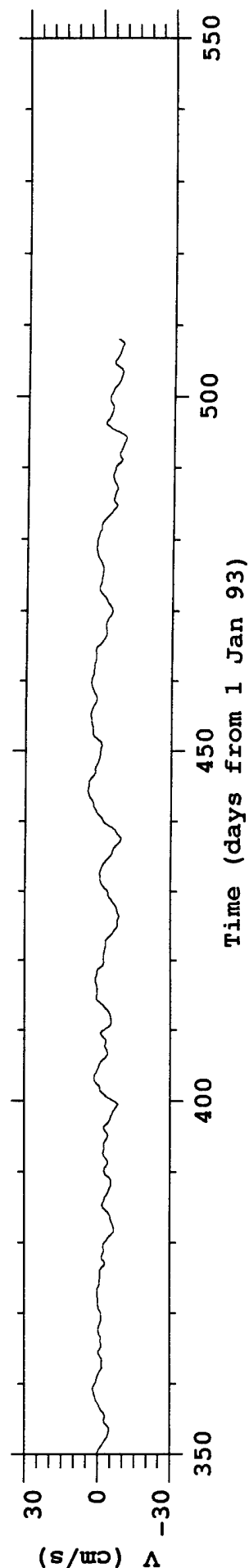
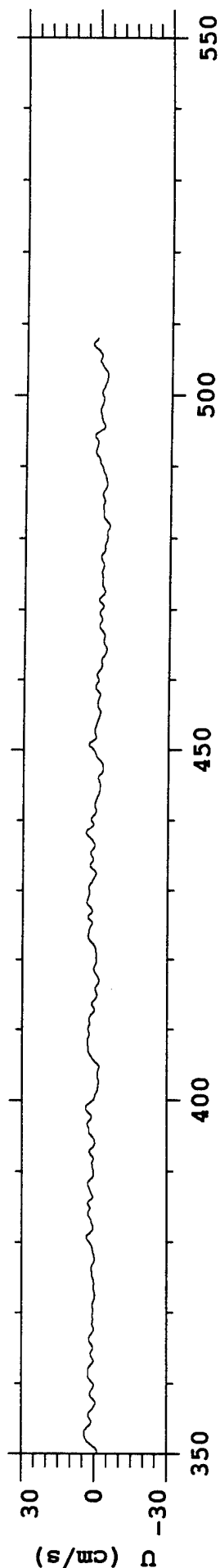
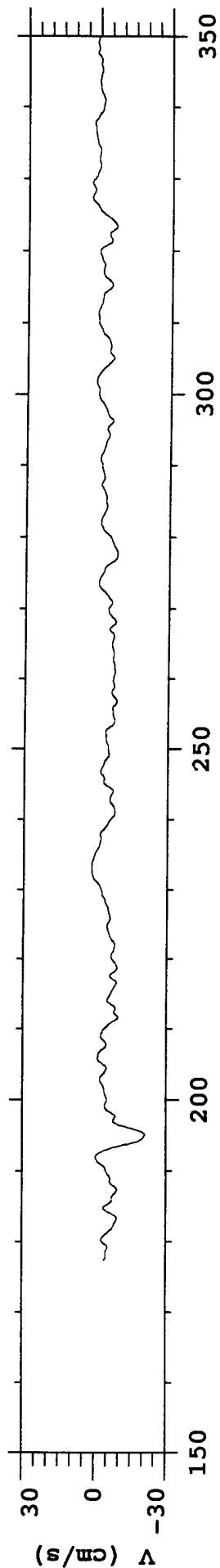
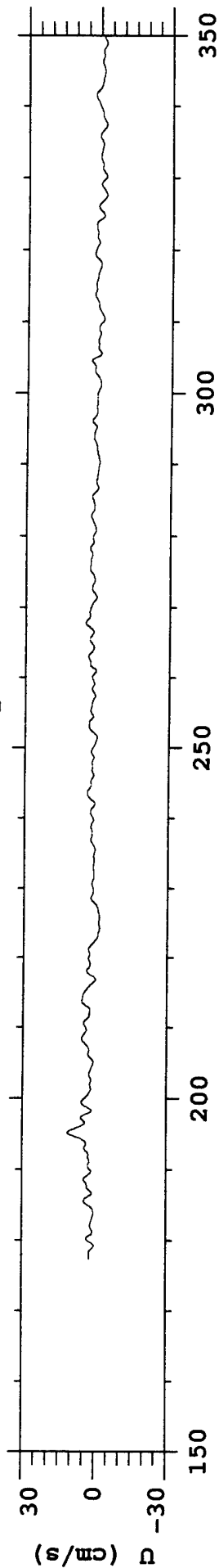
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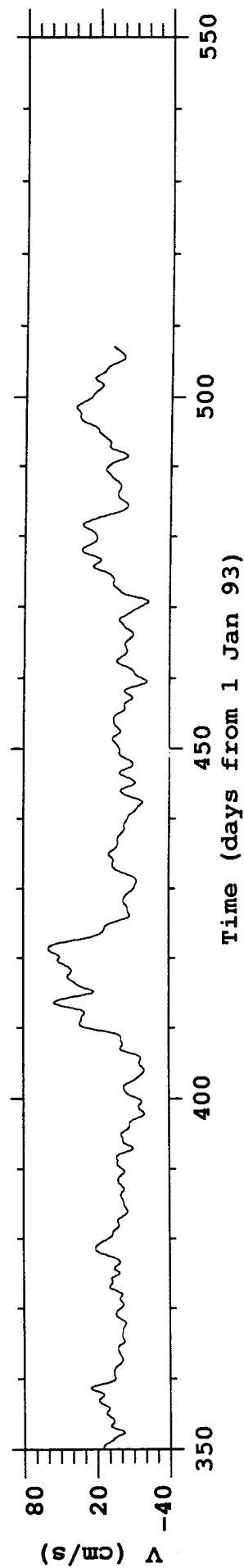
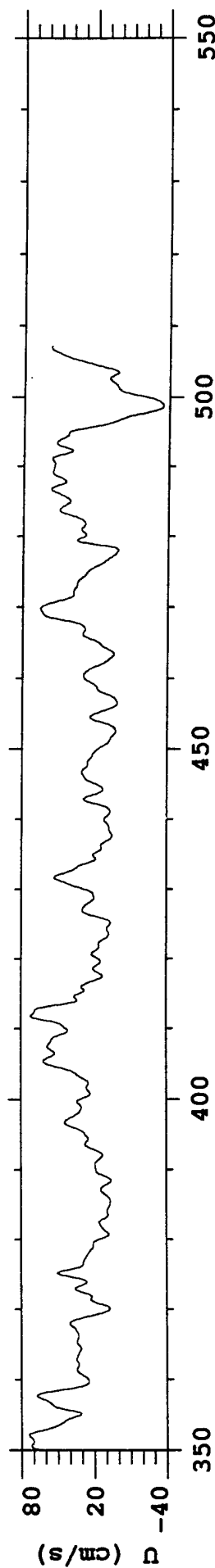
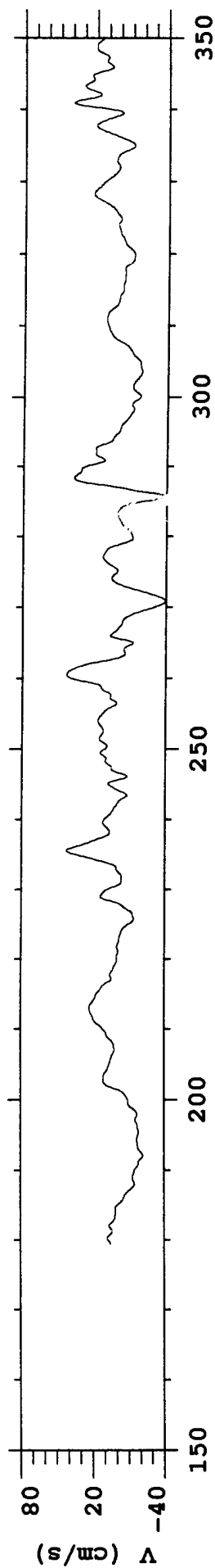
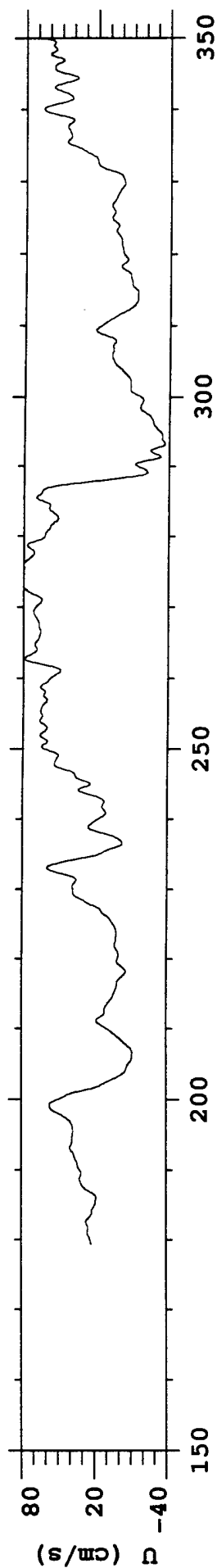
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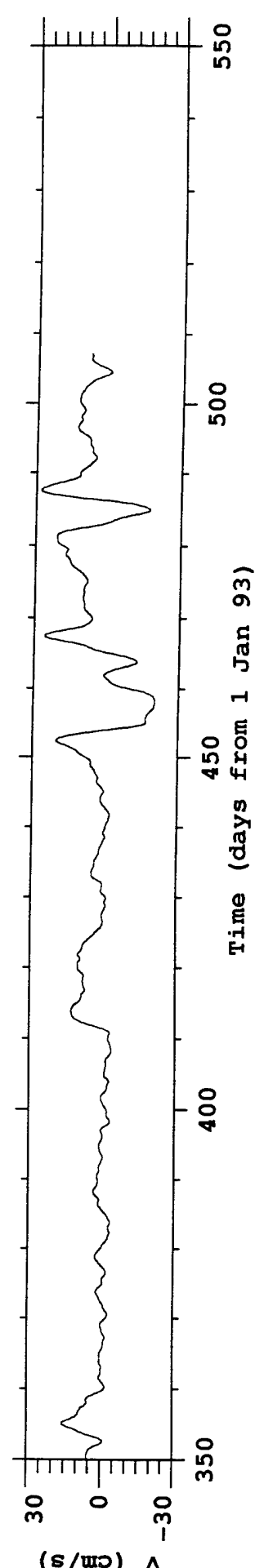
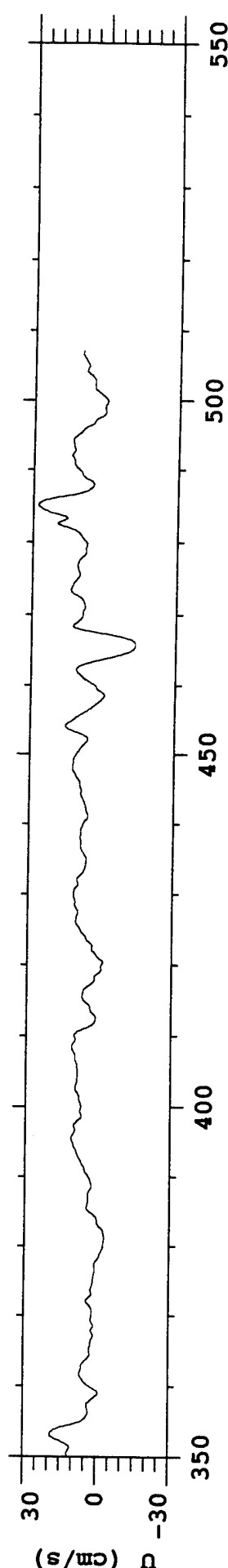
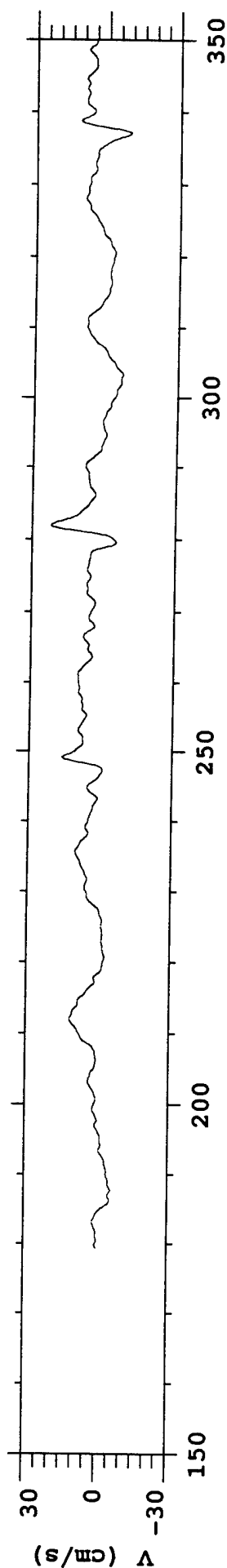
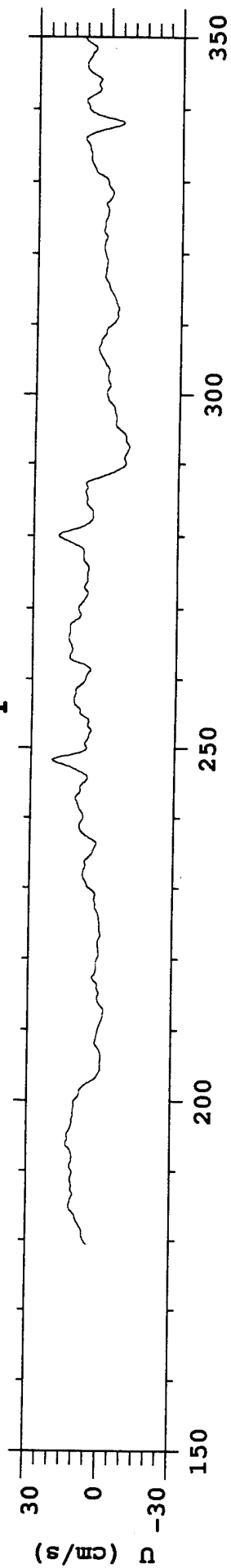
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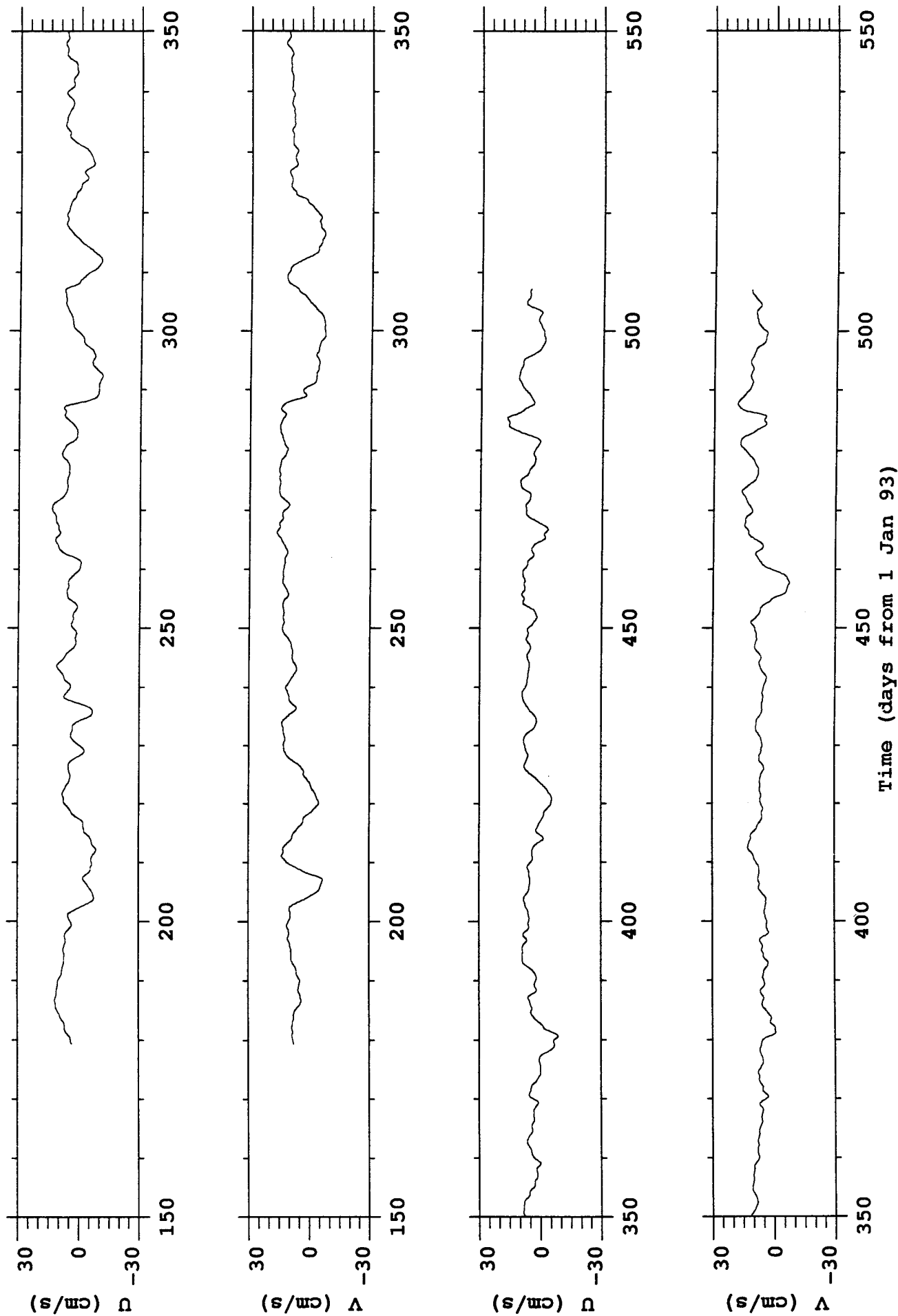
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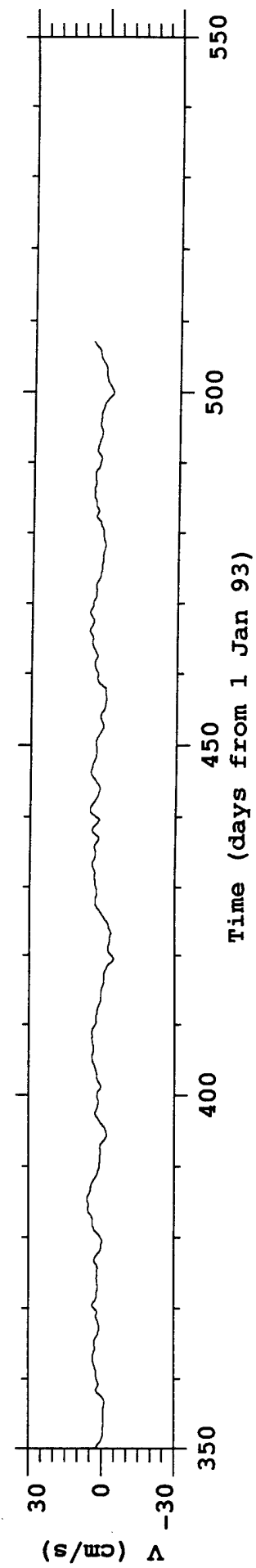
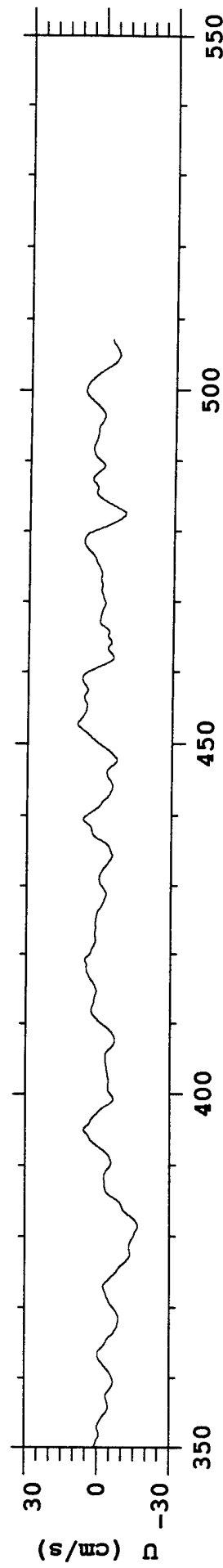
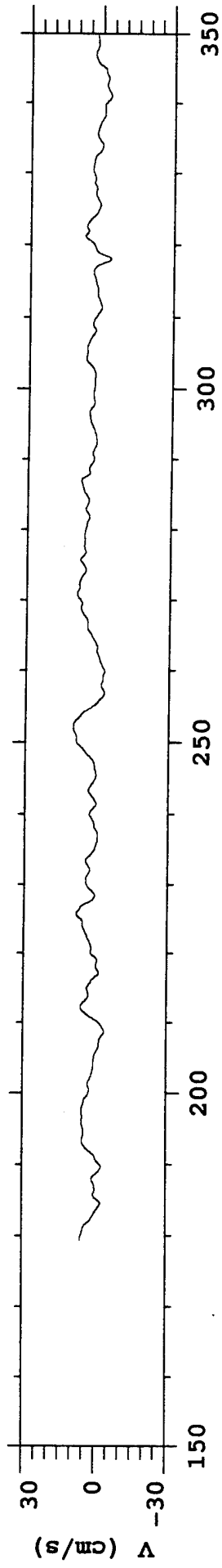
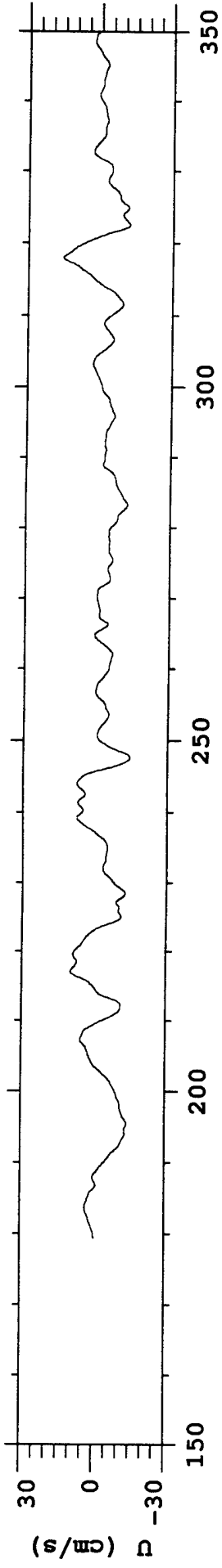
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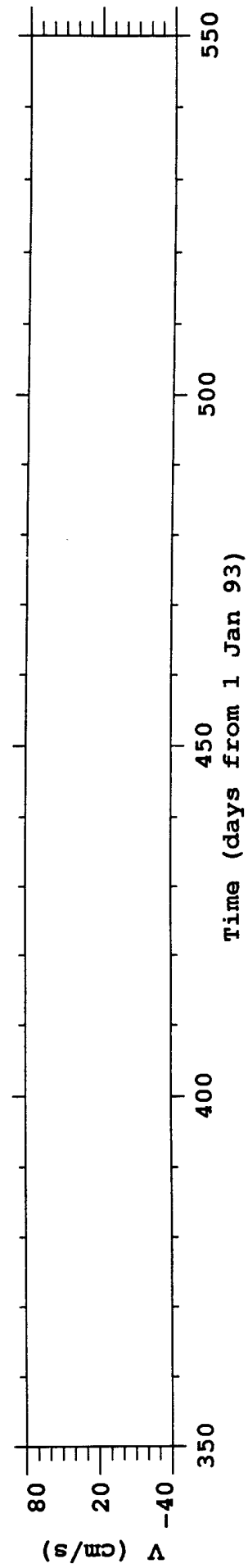
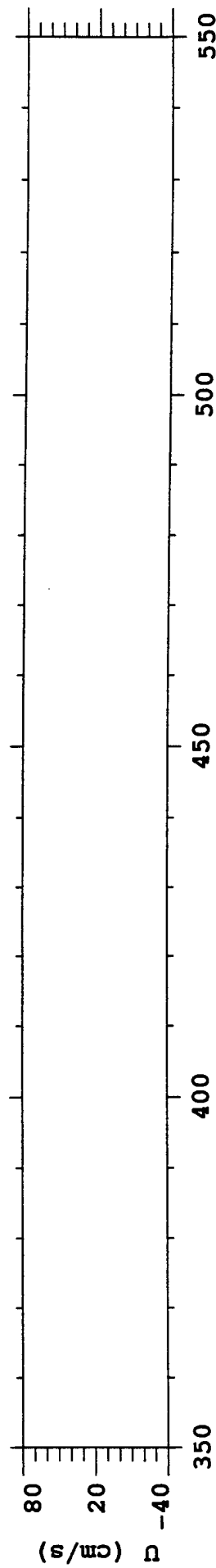
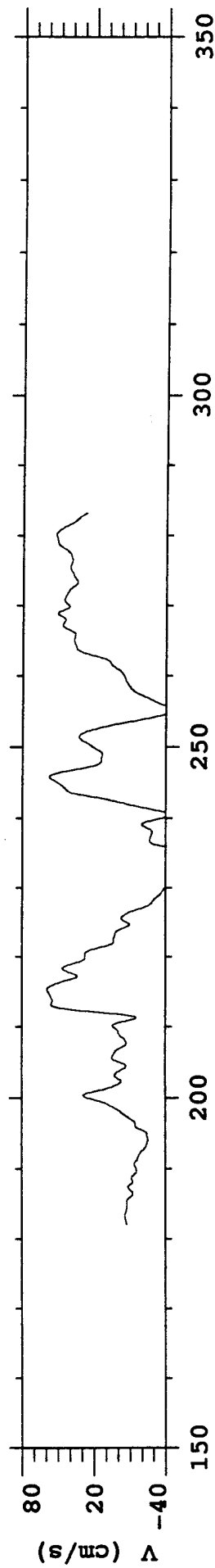
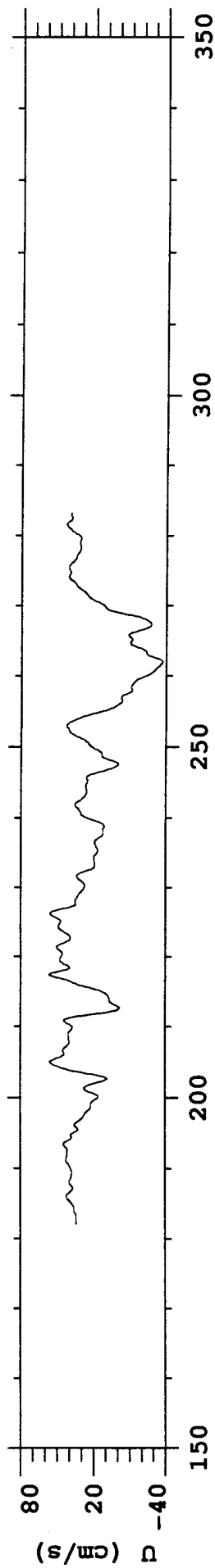
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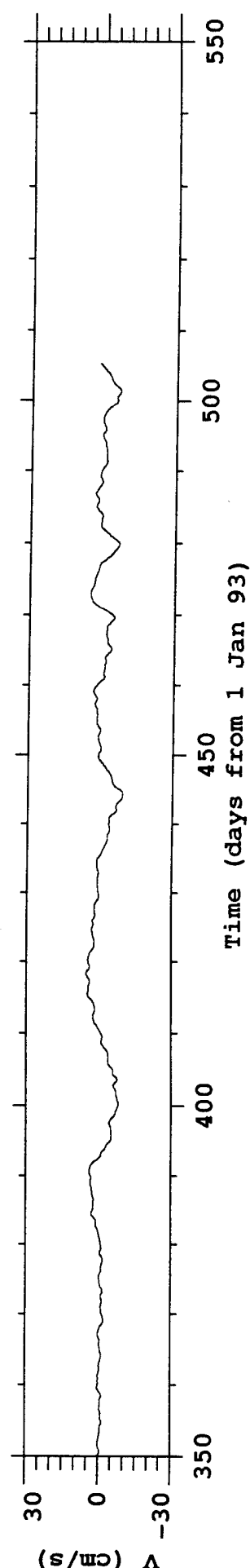
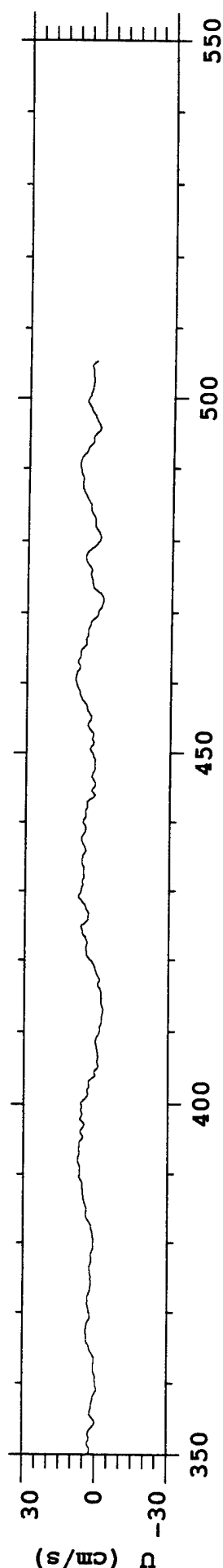
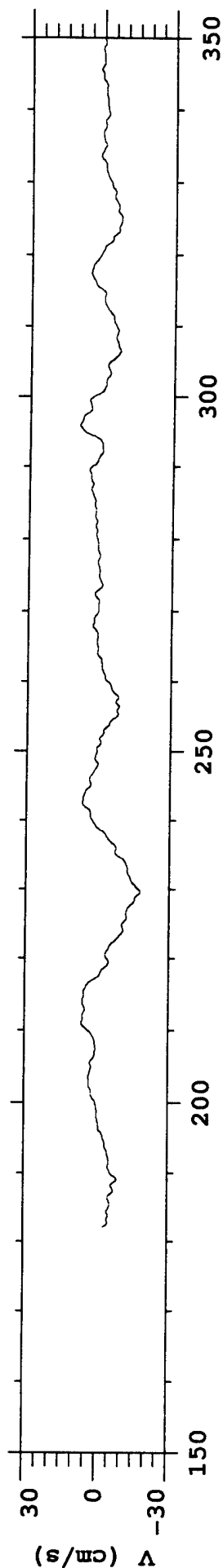
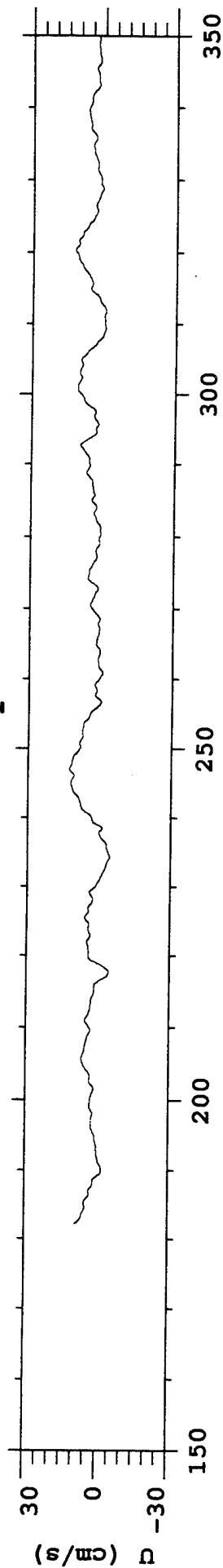
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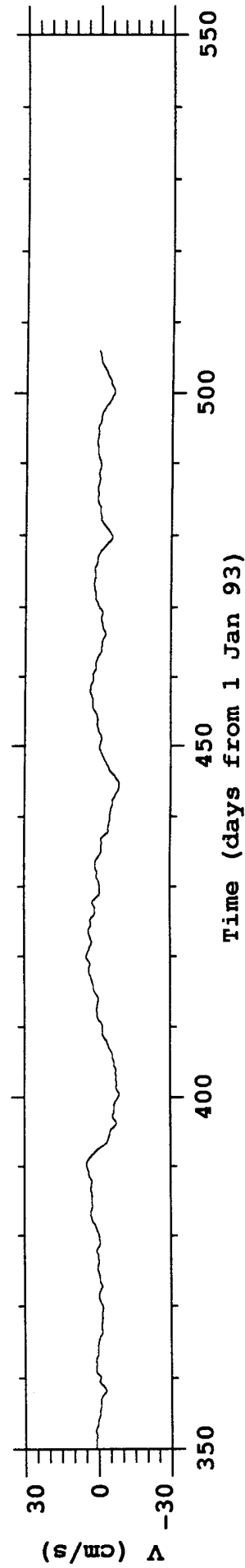
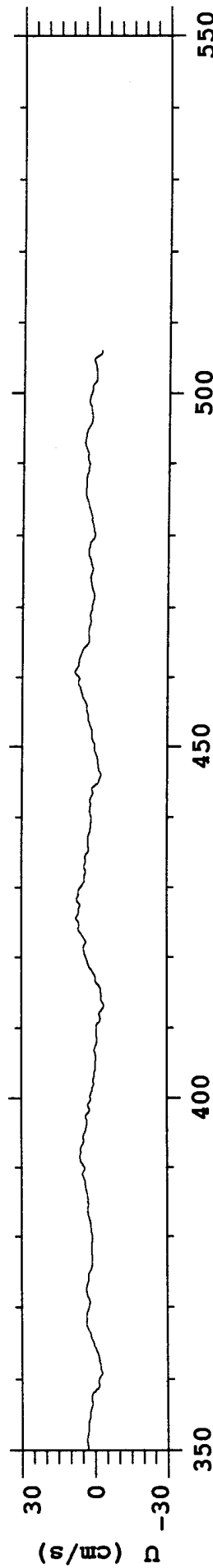
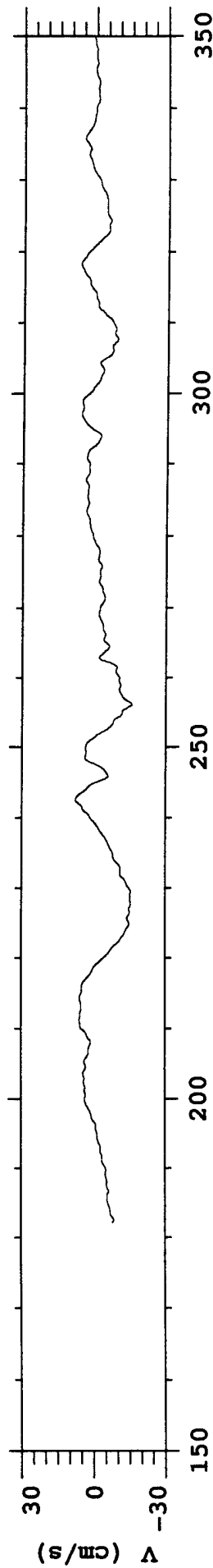
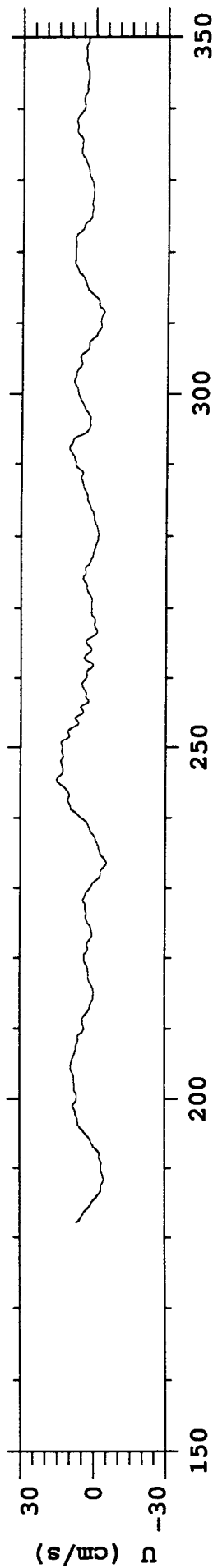


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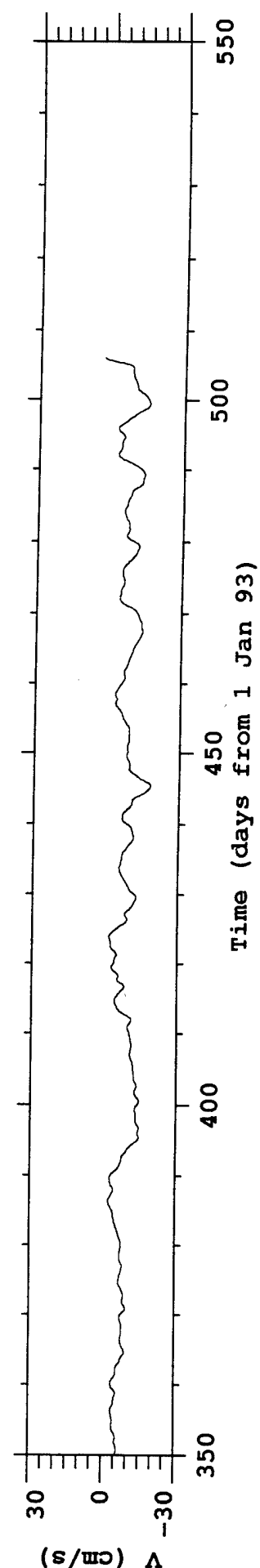
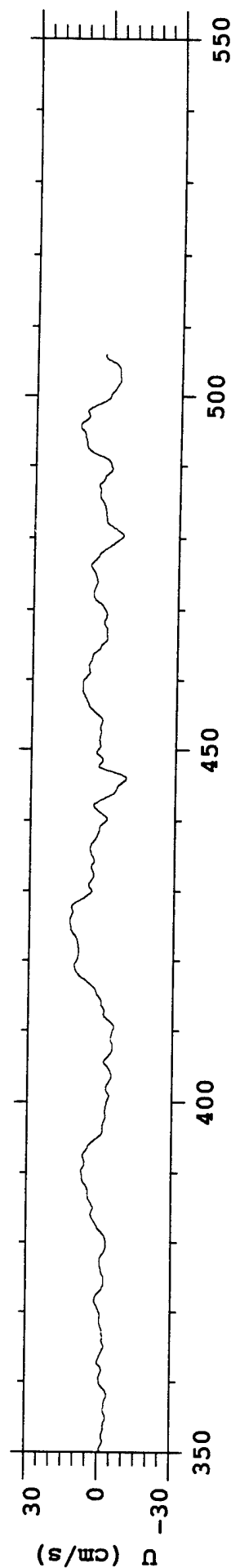
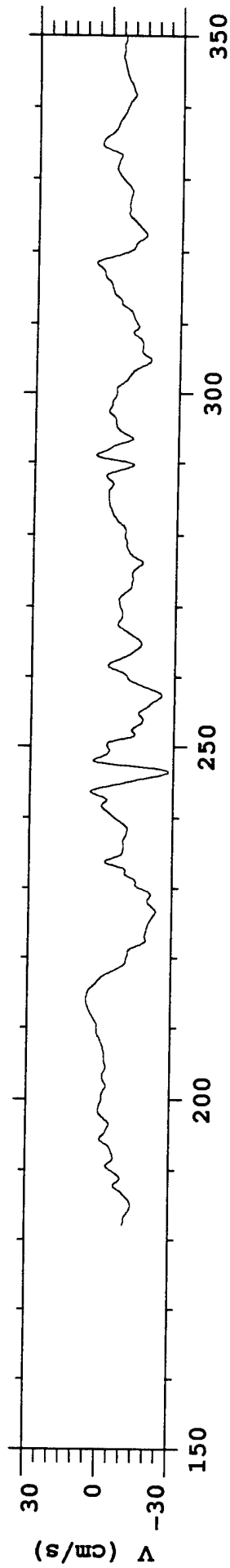
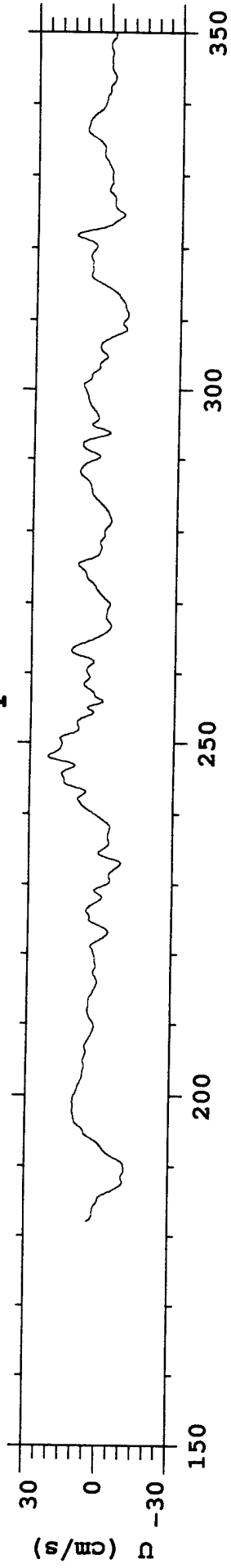


Time (days from 1 Jan 93)

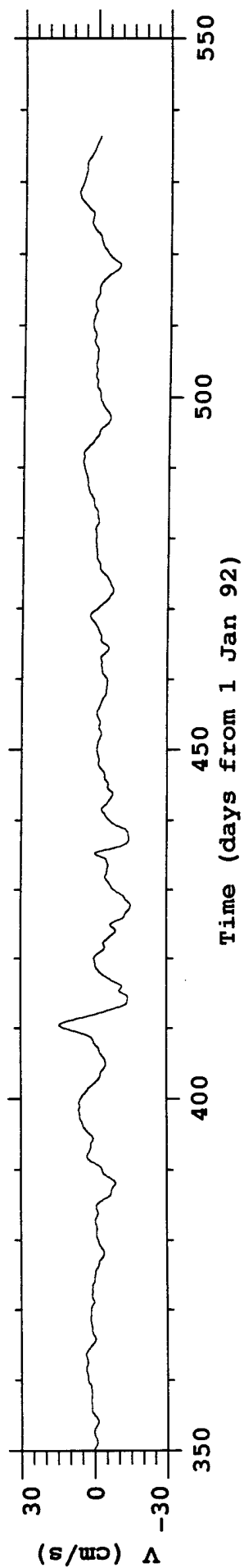
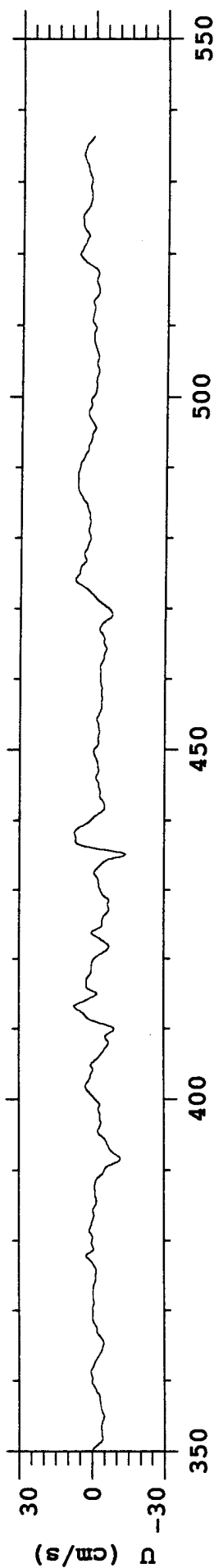
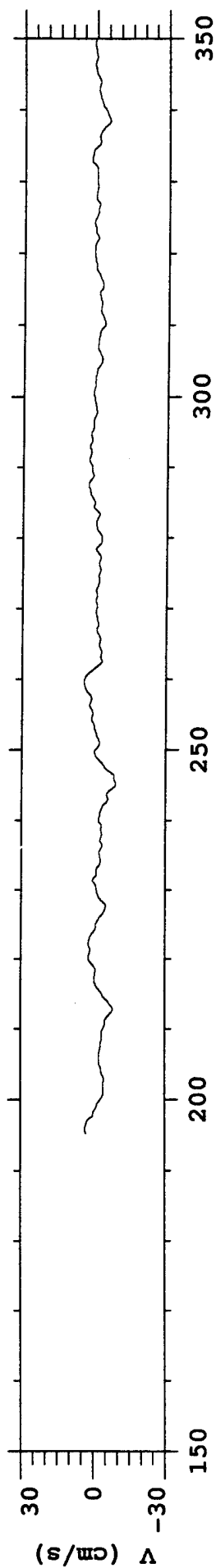
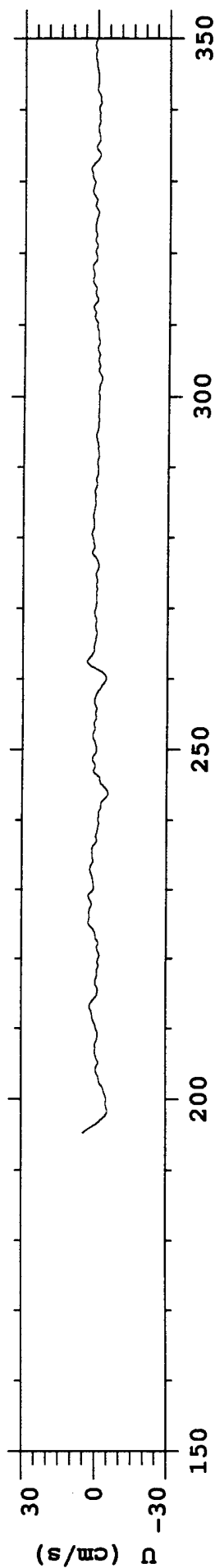
cm93e3-1p



cm93e4-1p

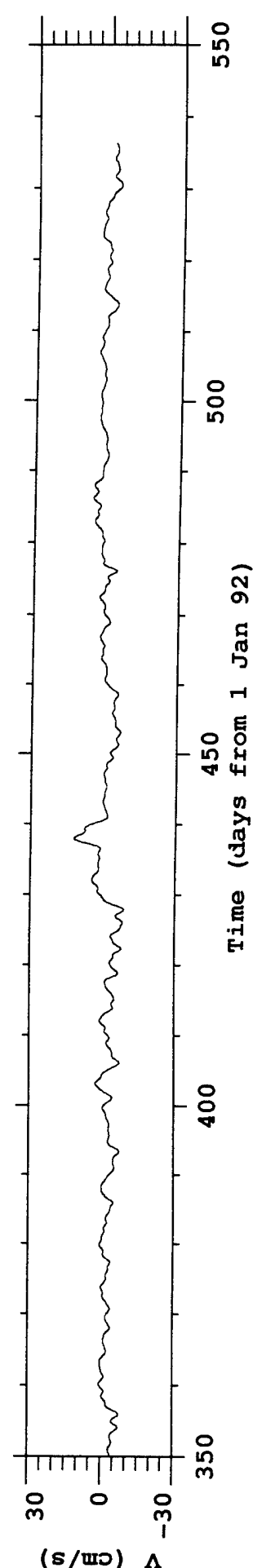
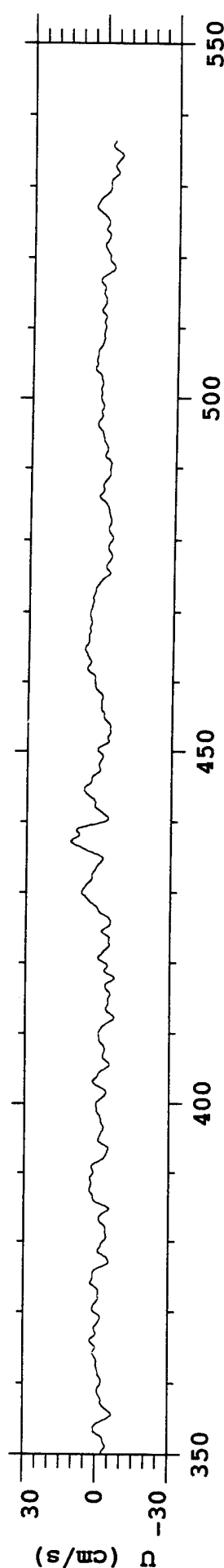
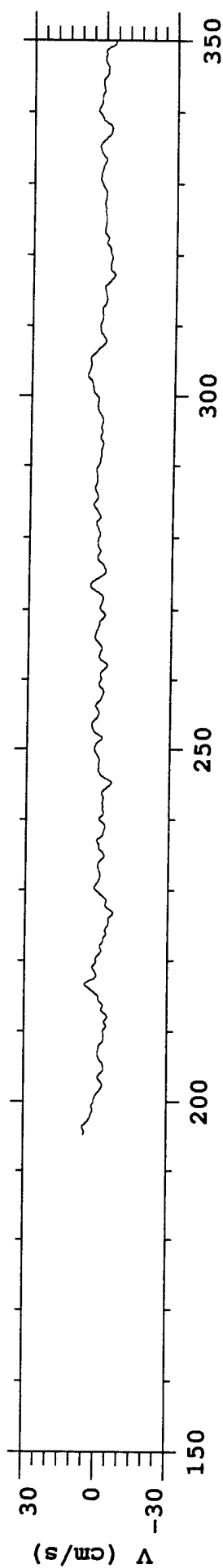
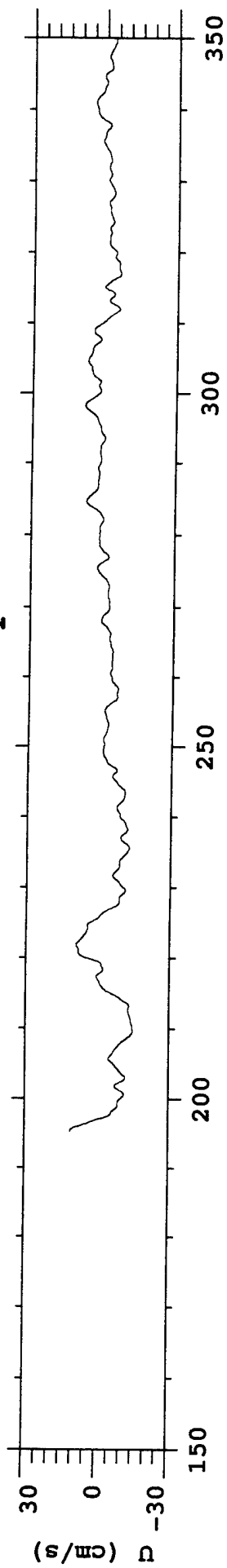


cm92b1-offset-lp

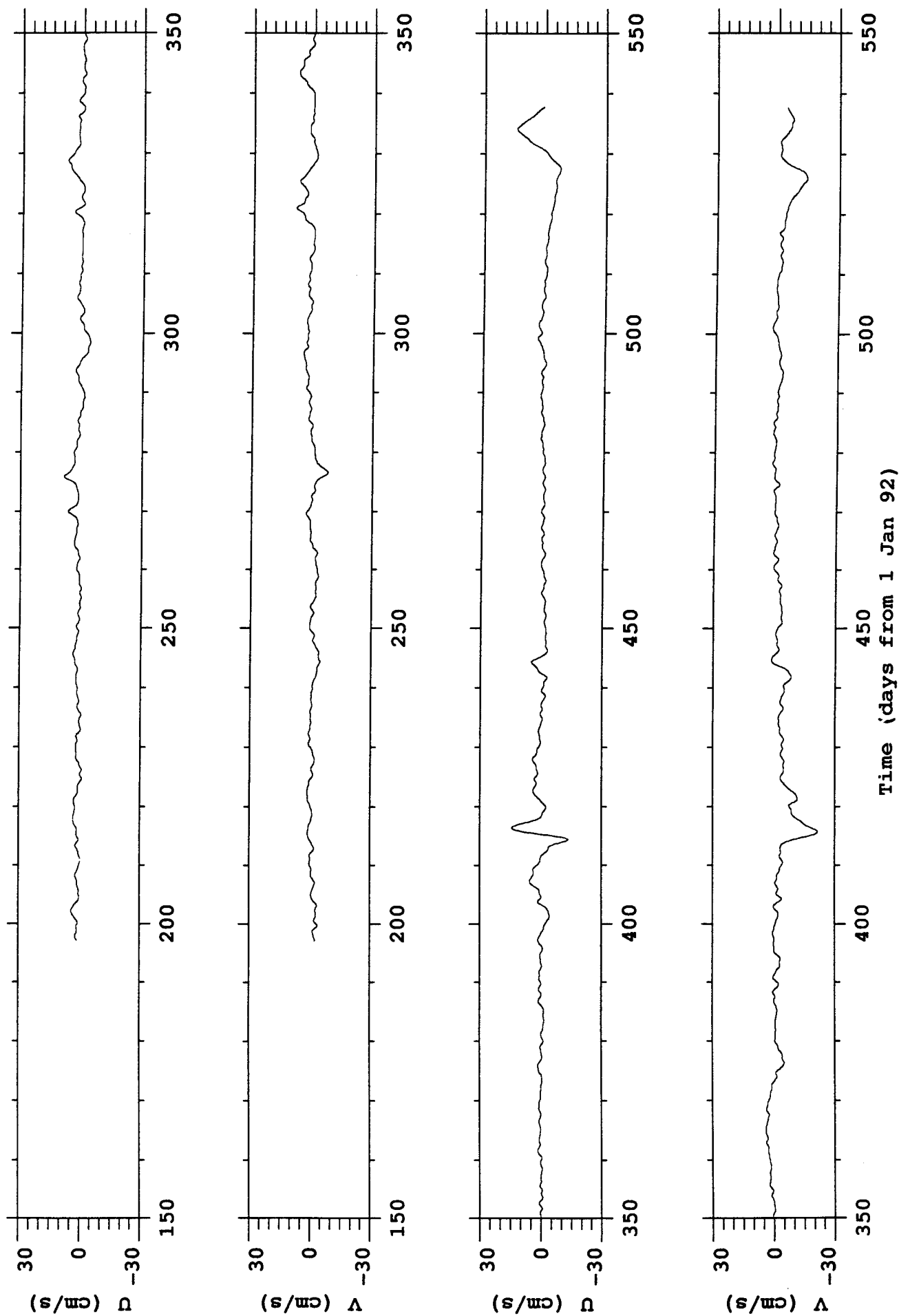


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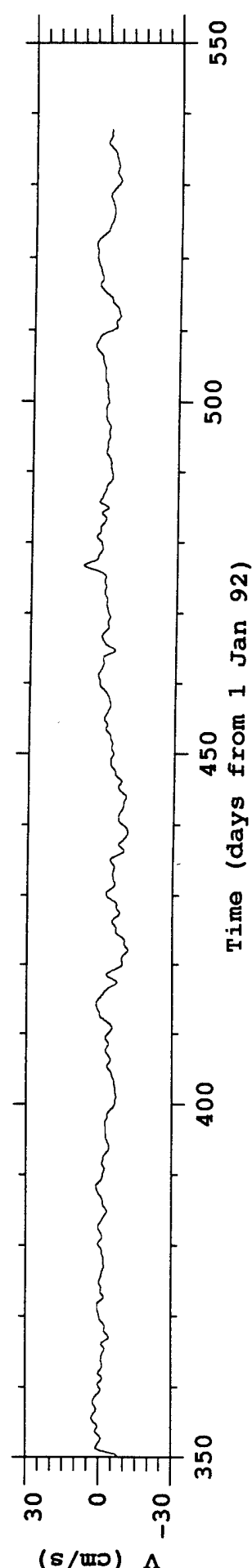
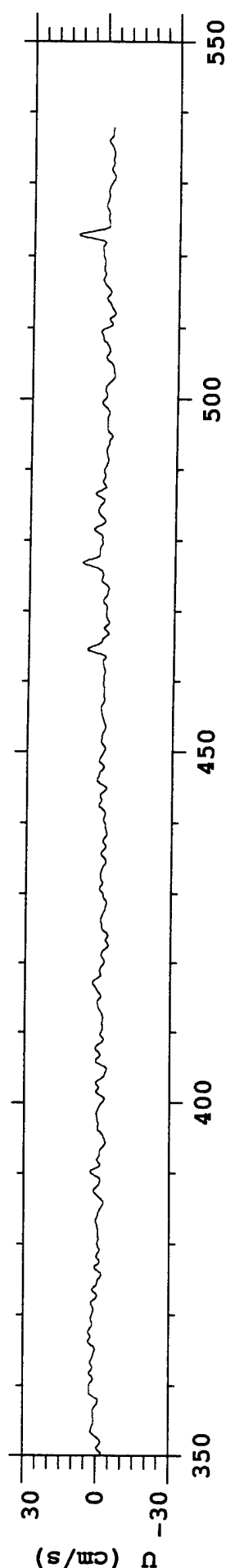
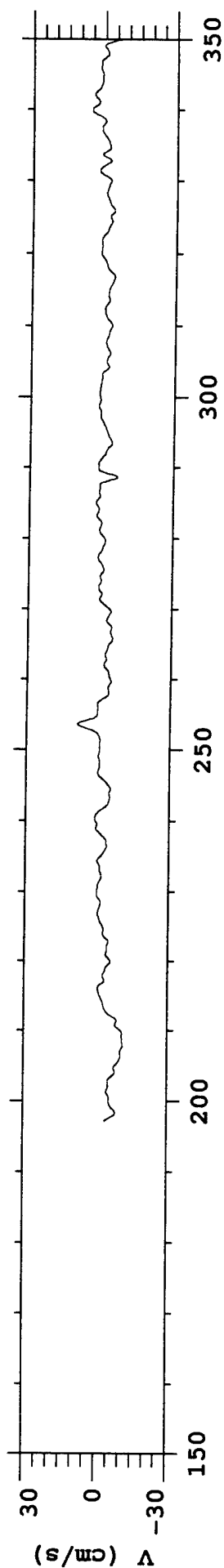
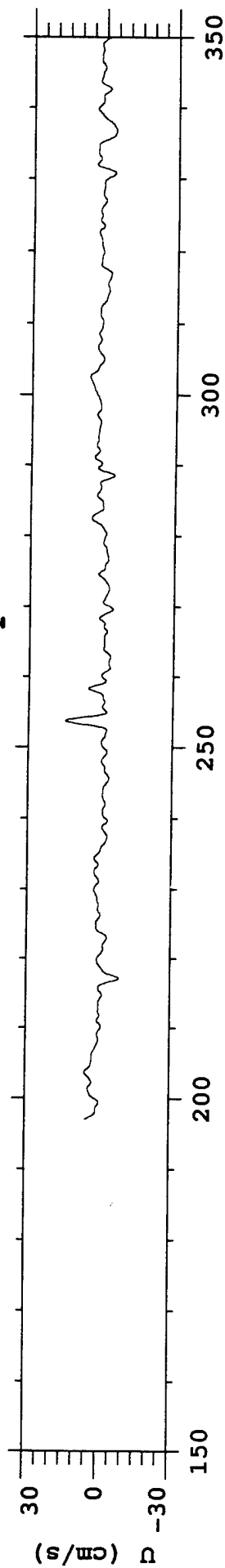
cm92b2-offset-1p



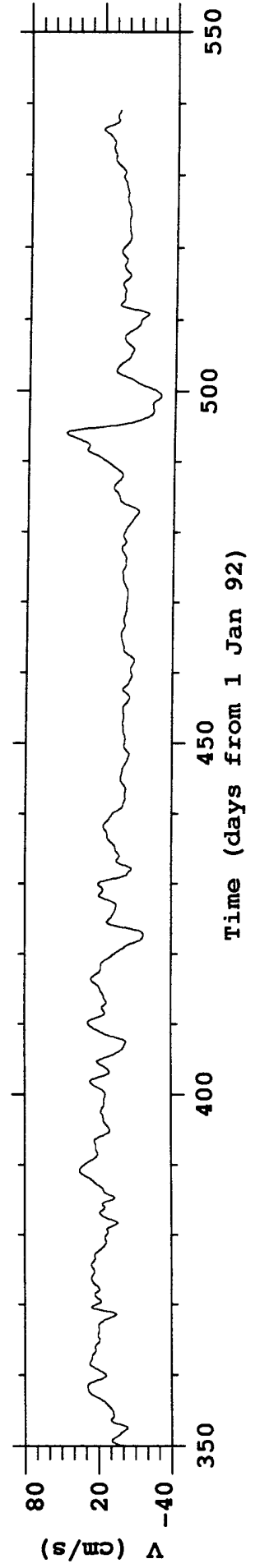
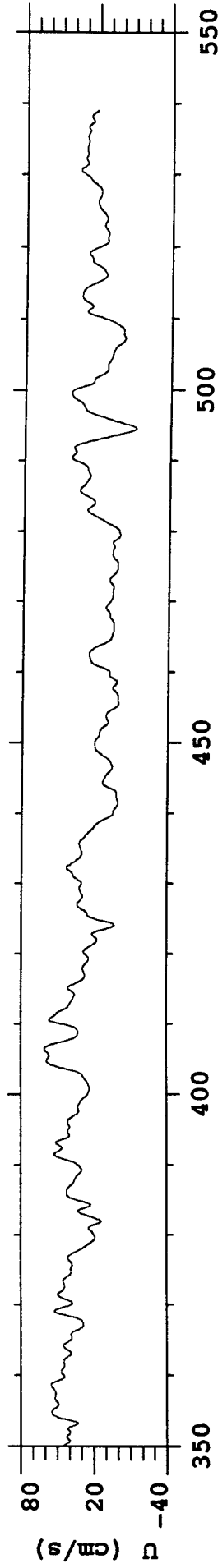
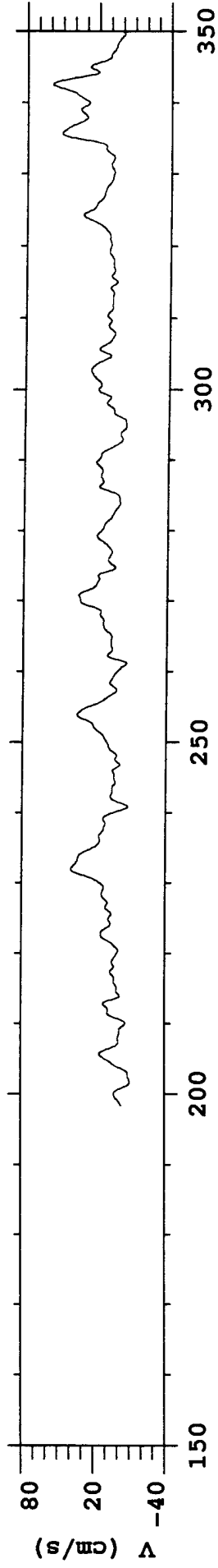
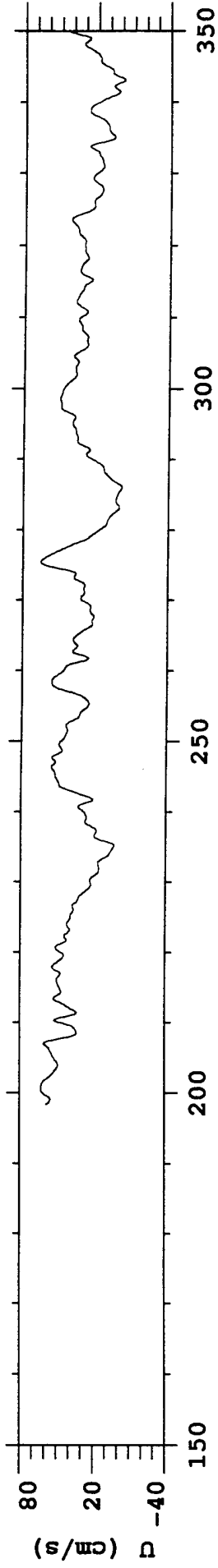
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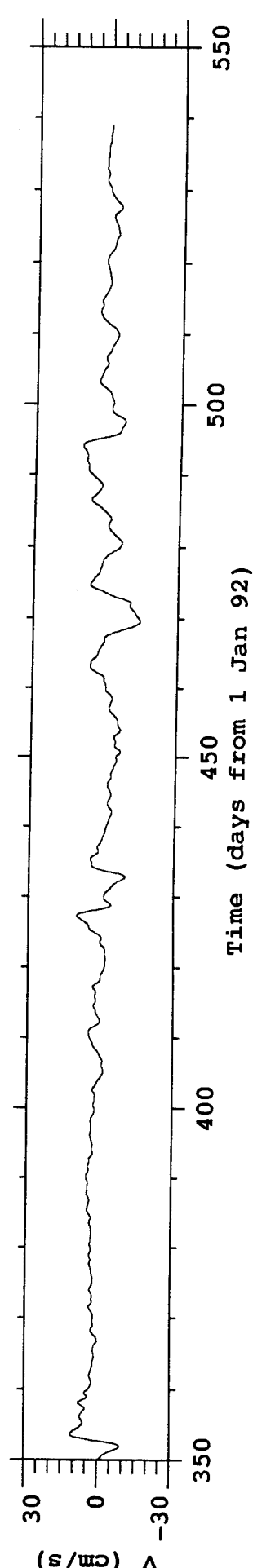
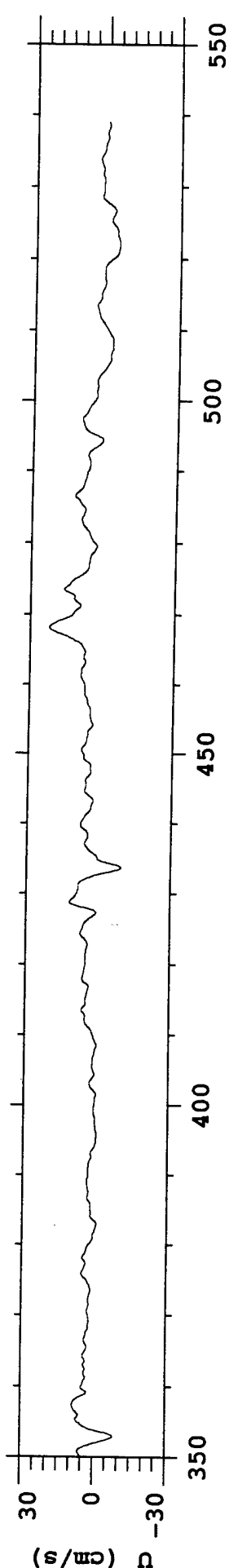
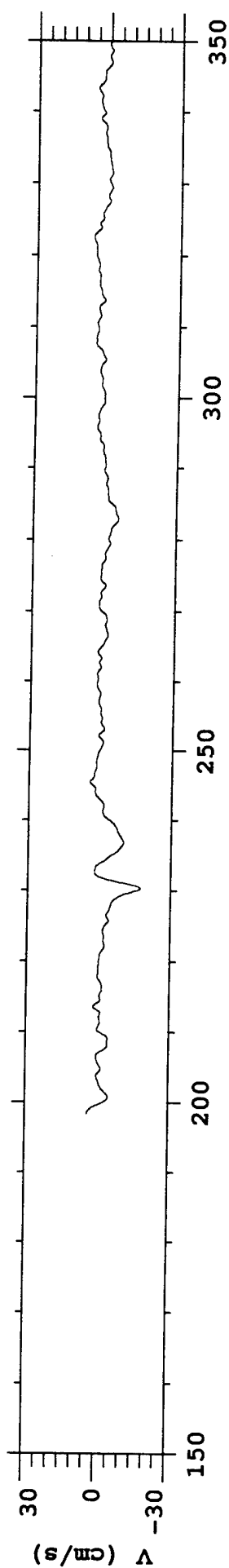
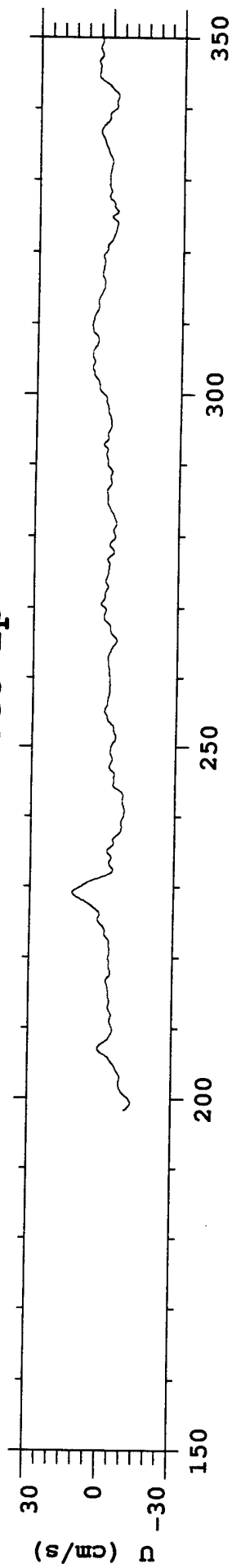
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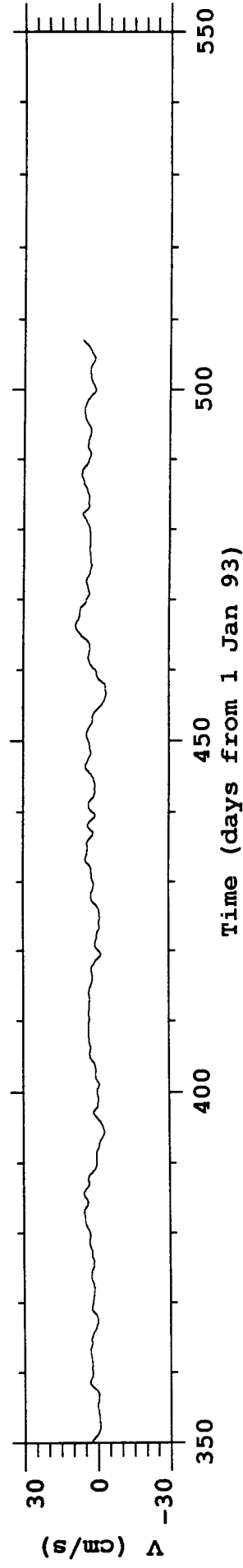
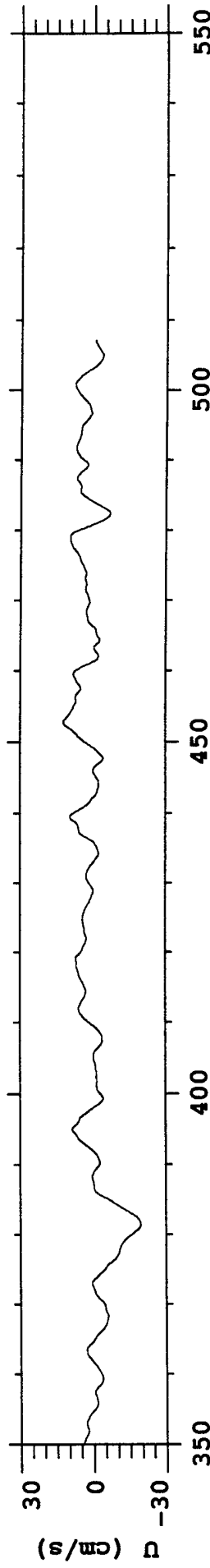
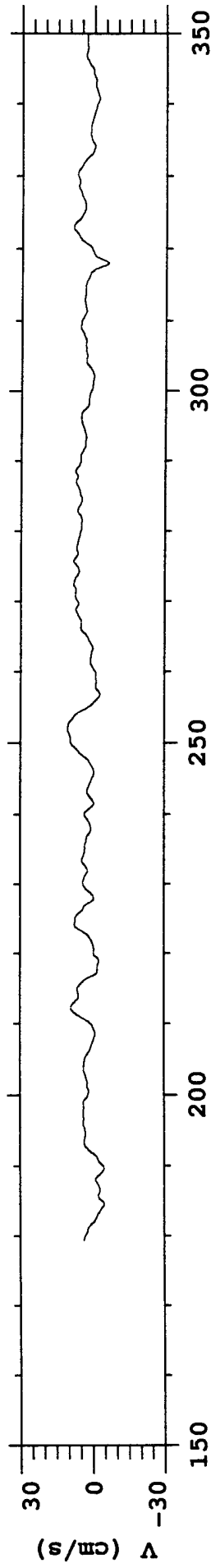
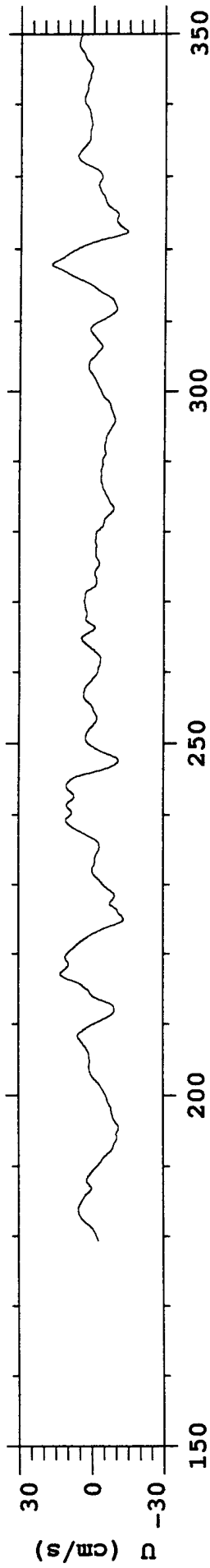
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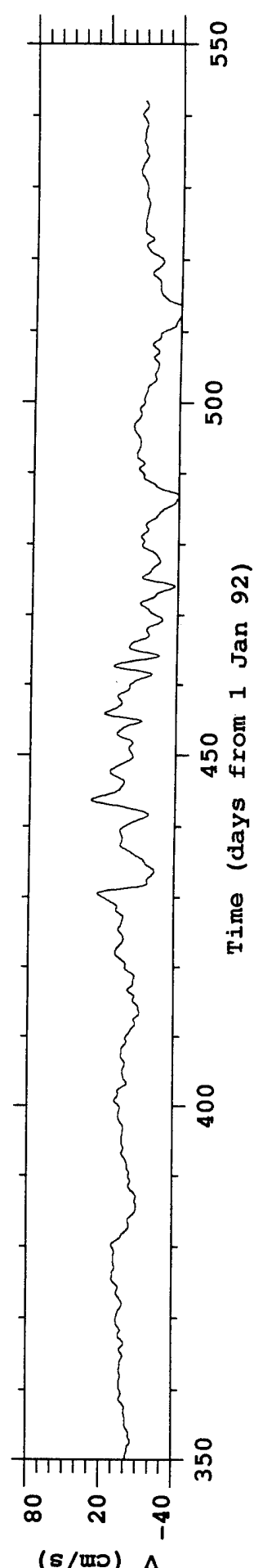
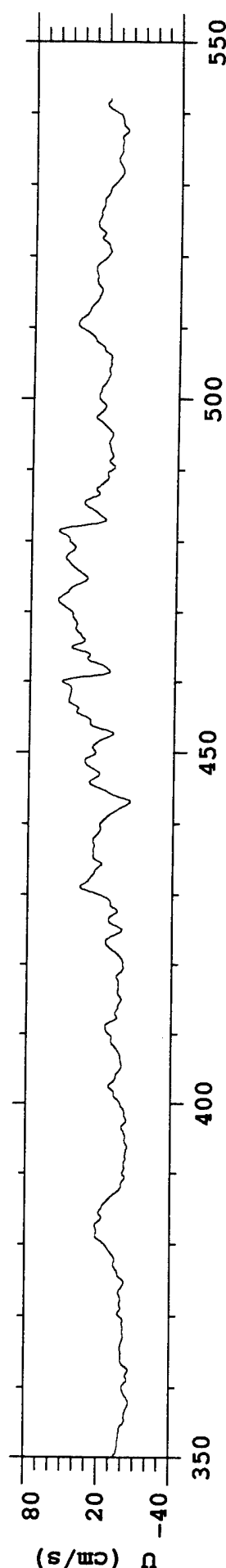
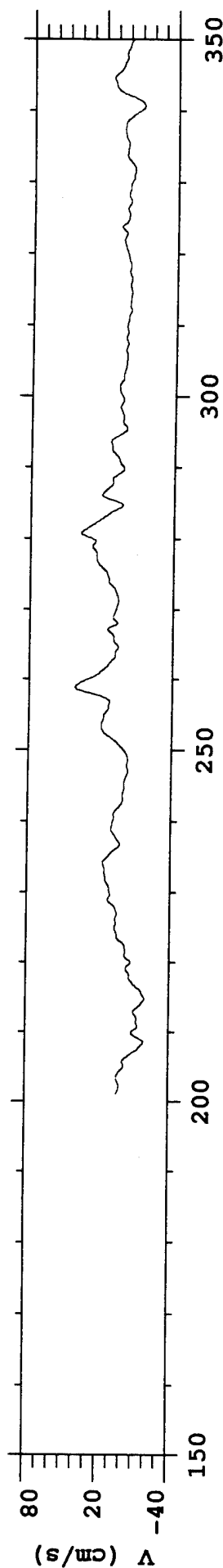
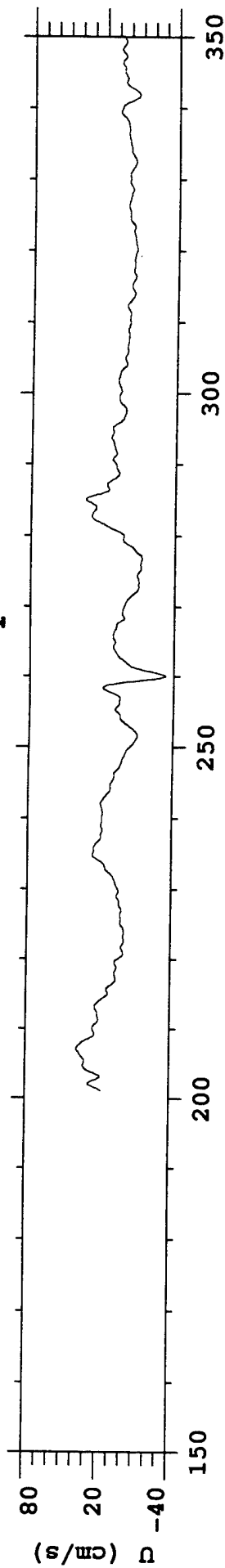
cm92d2-offset-1p



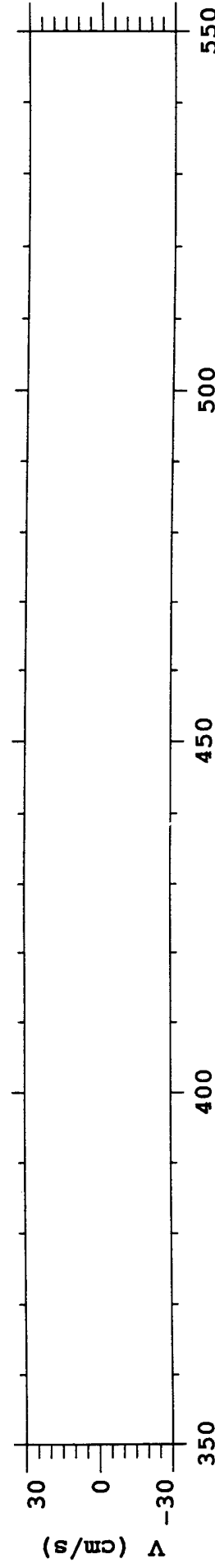
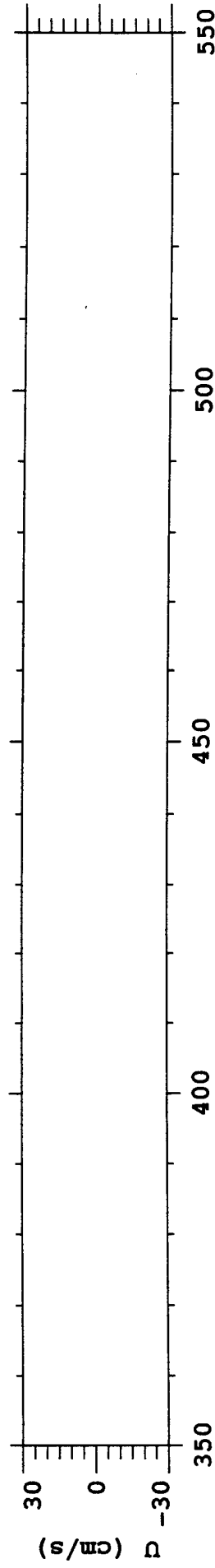
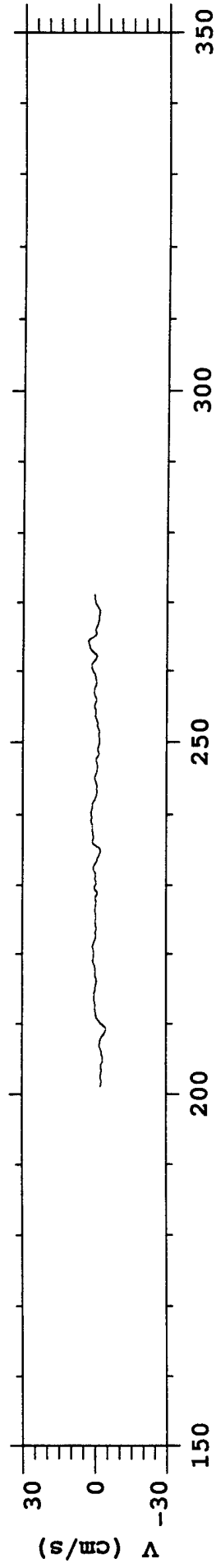
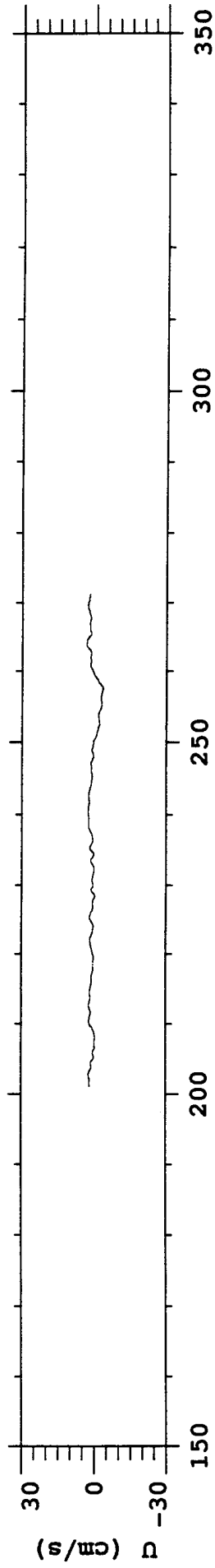
cm93d4--offset-1p



cm92e1-offset-lp

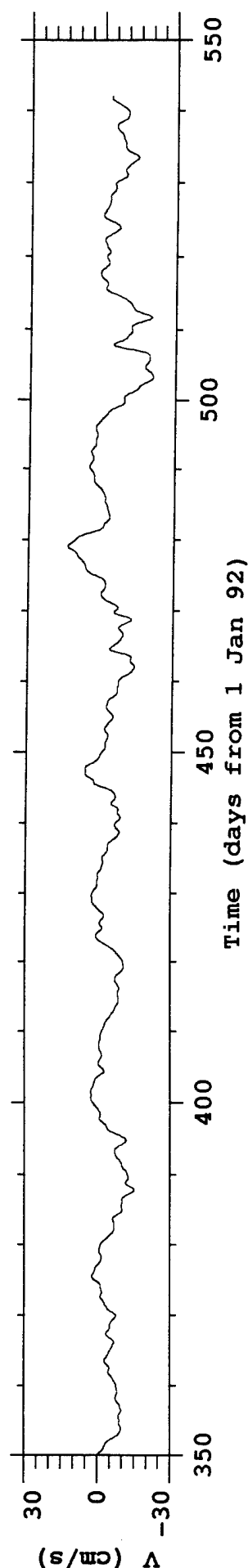
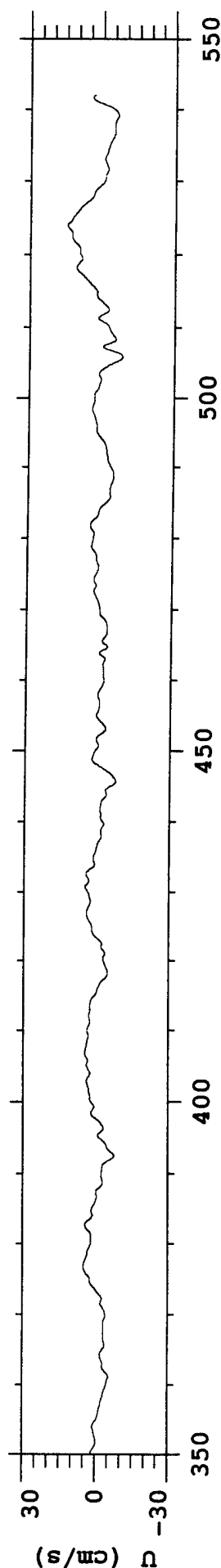
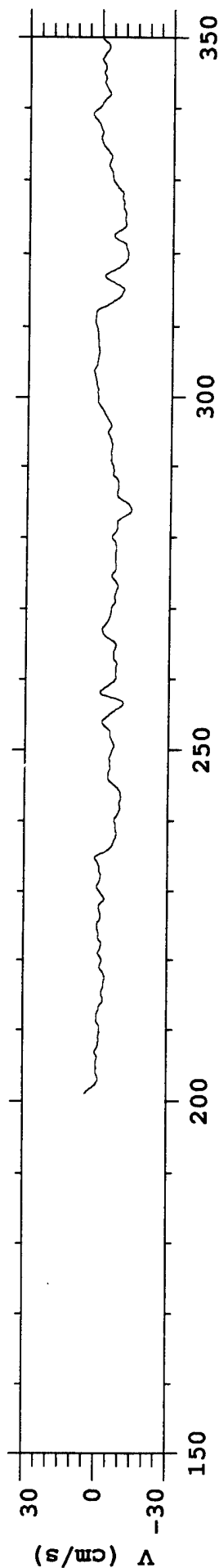
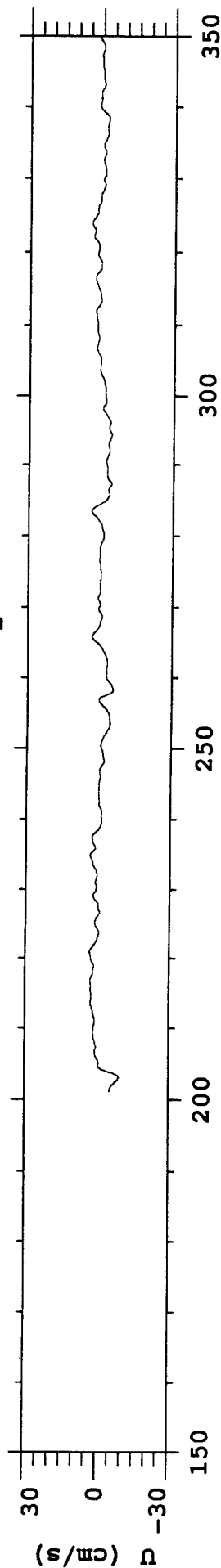


cm92e2-offset-1p

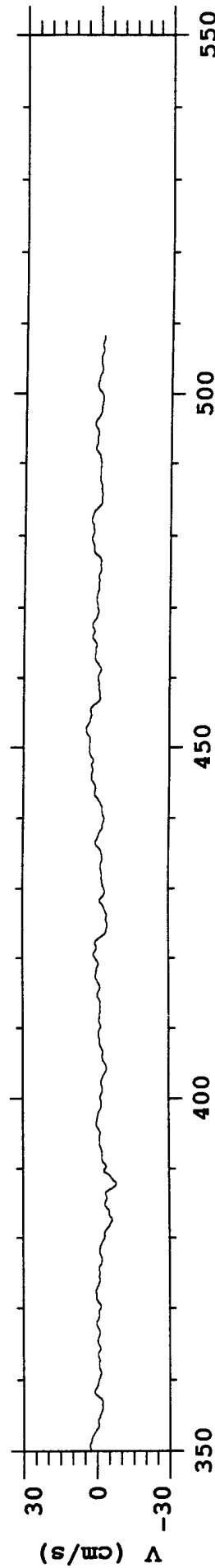
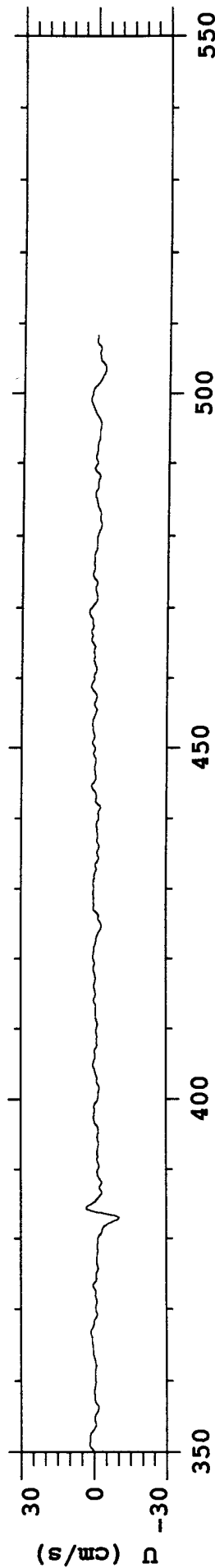
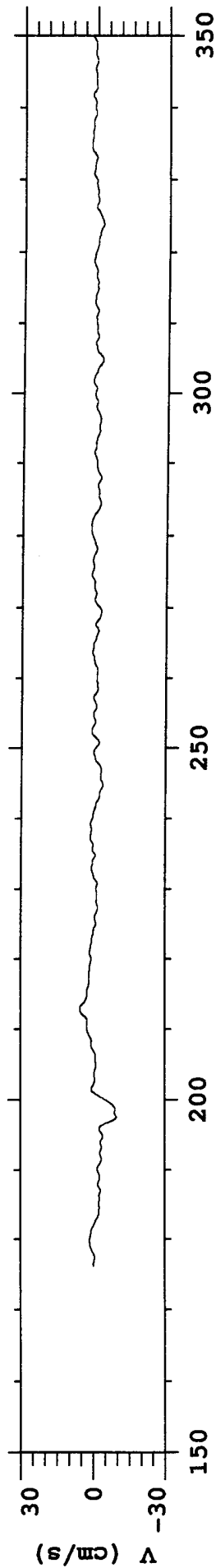
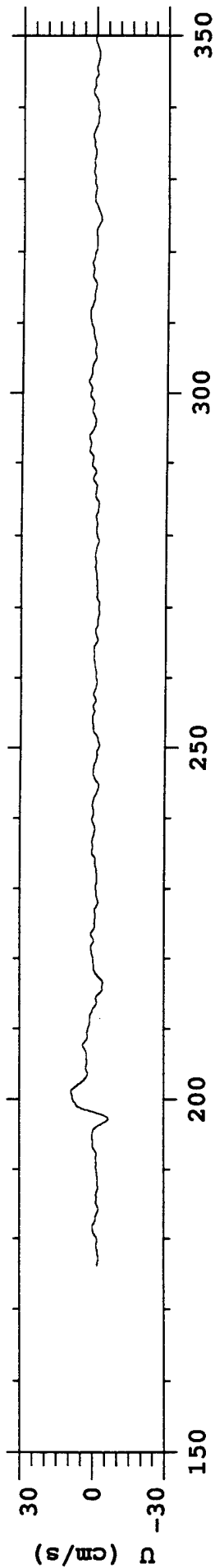


Time (days from 1 Jan 92)

cm92e4-offset-1p

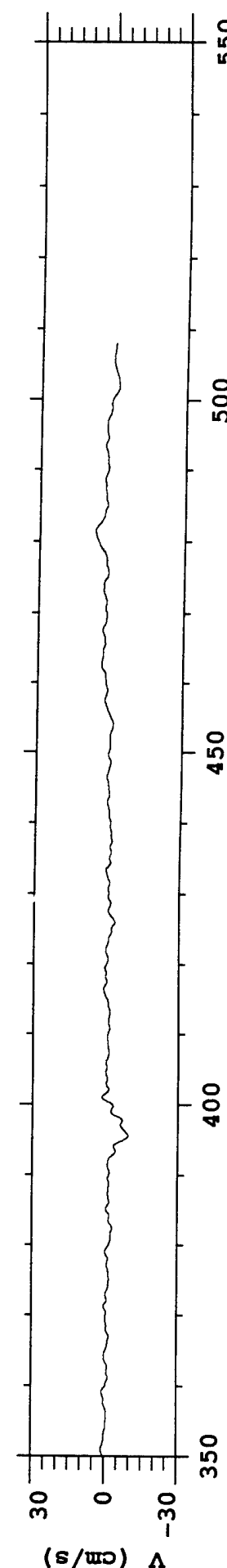
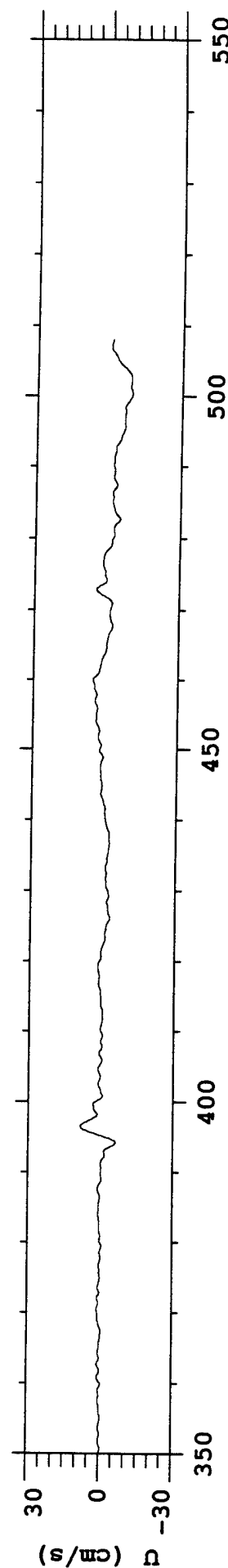
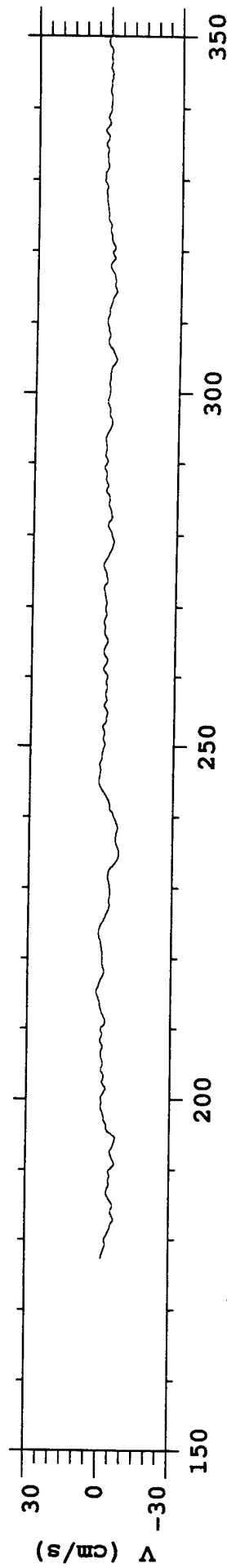
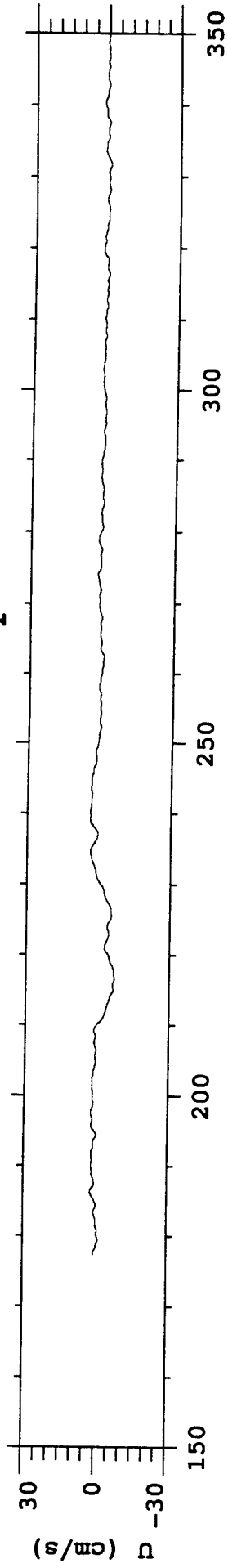


cm93b1-offset-lp



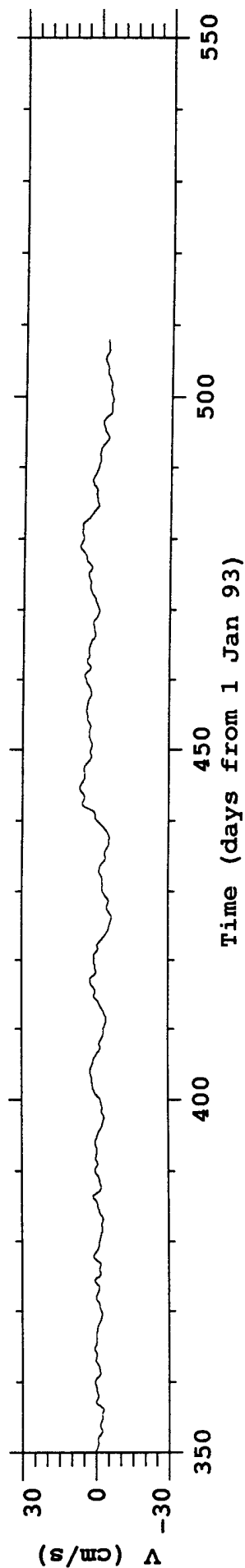
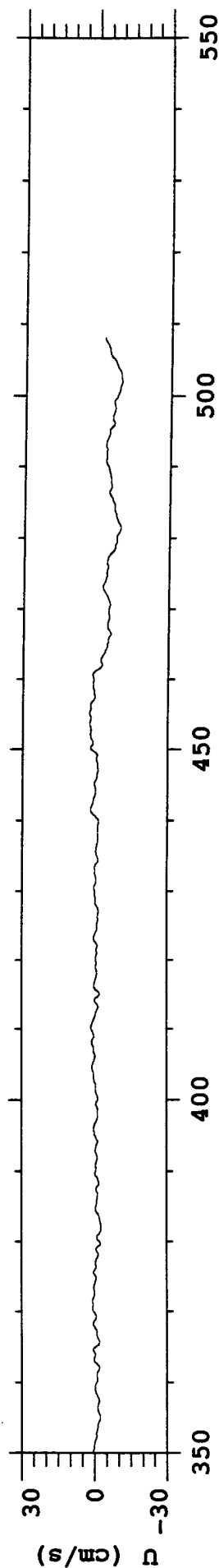
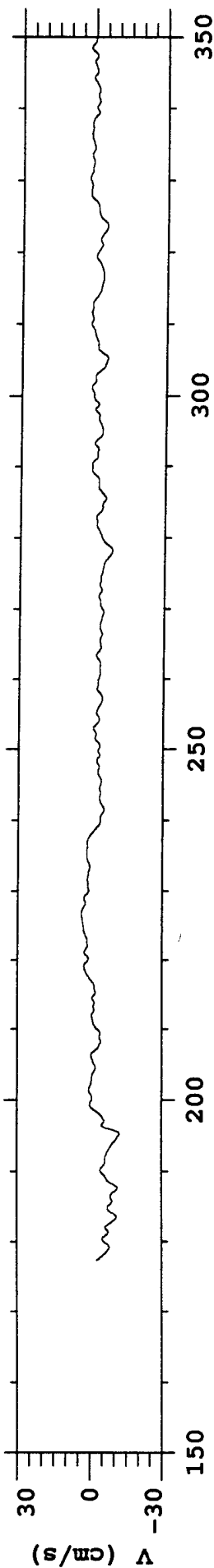
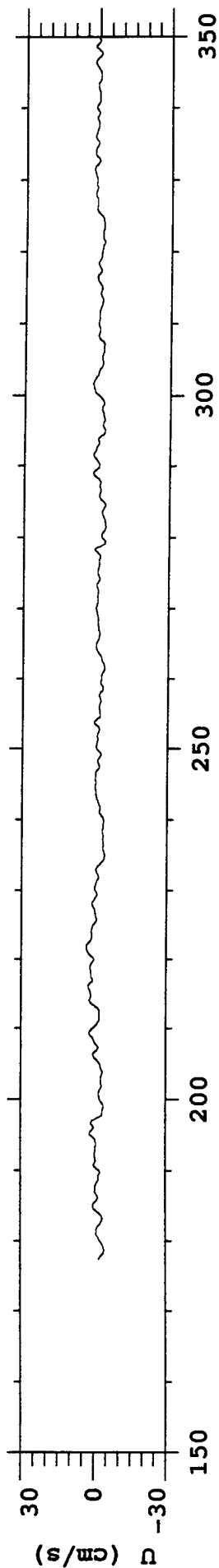
Time (days from 1 Jan 93)

cm93c1-offset-lp

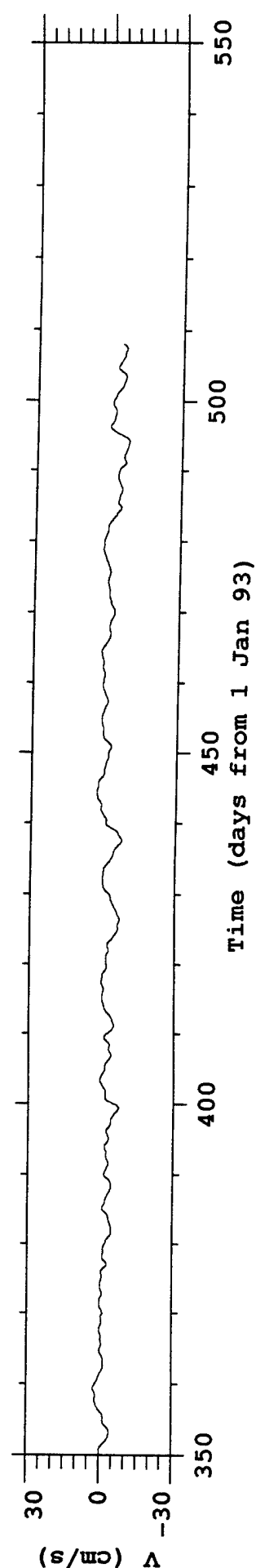
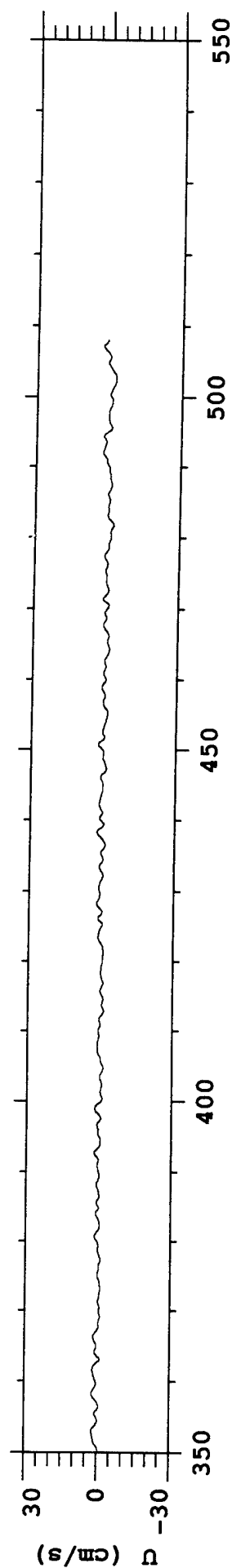
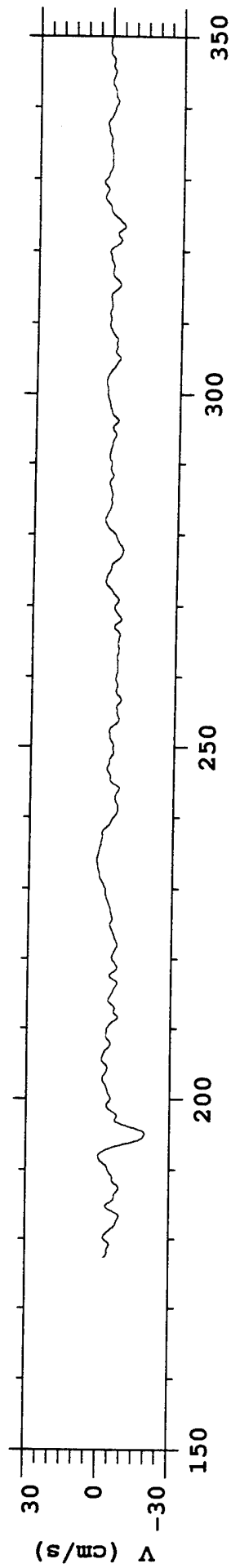
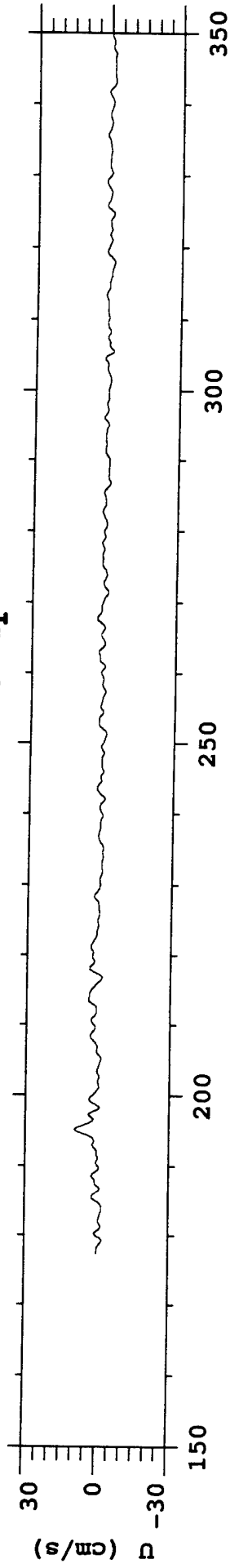


Time (days from 1 Jan 93)

cm93c2-offset-lp

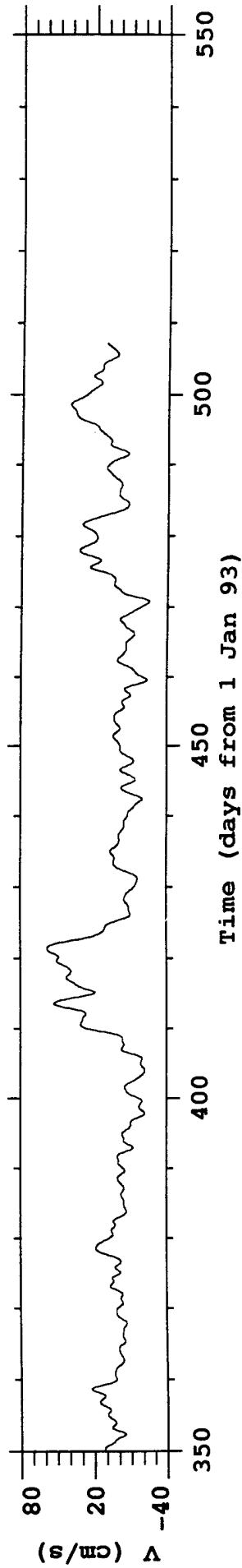
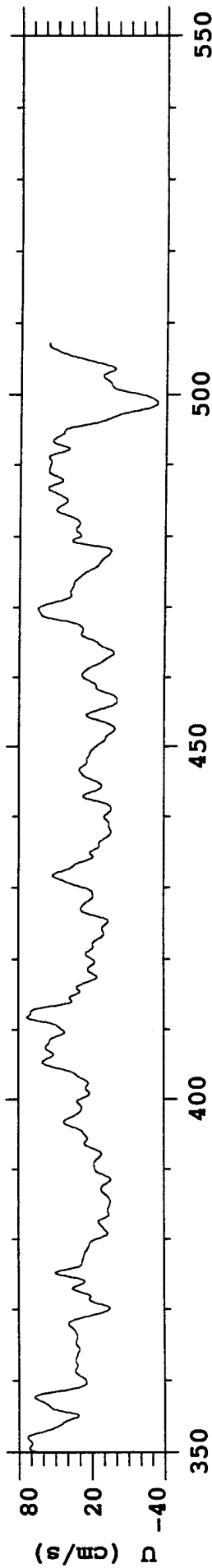
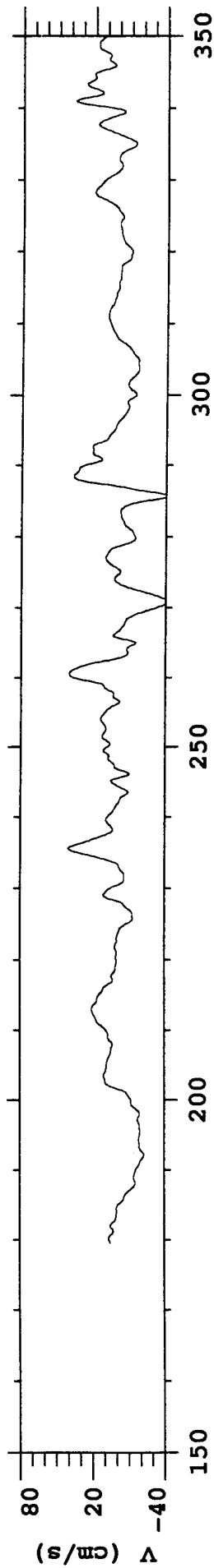
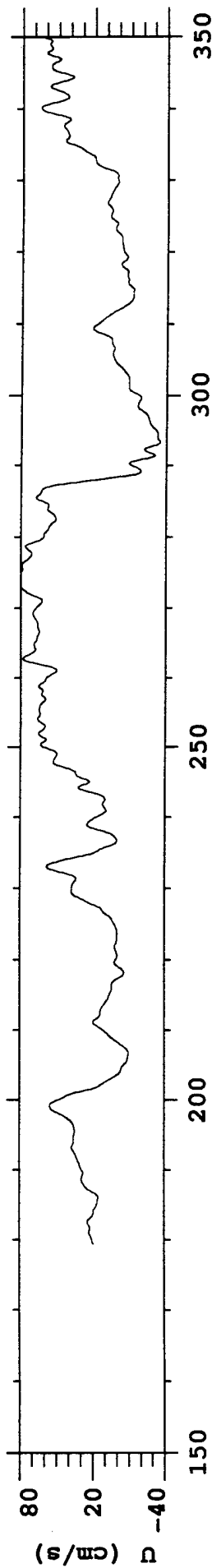


cm93c3-offset-1p

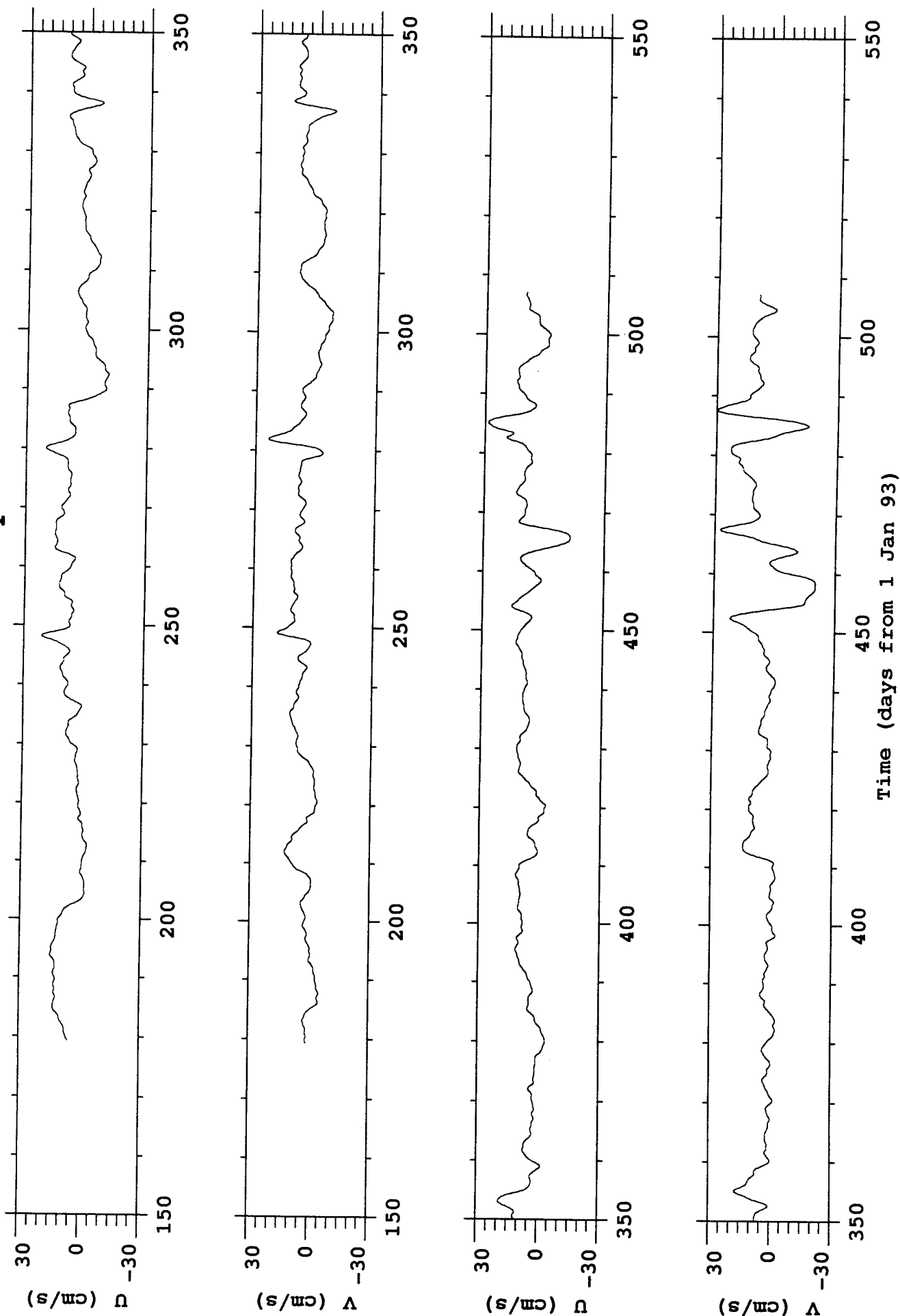


Time (days from 1 Jan 93)

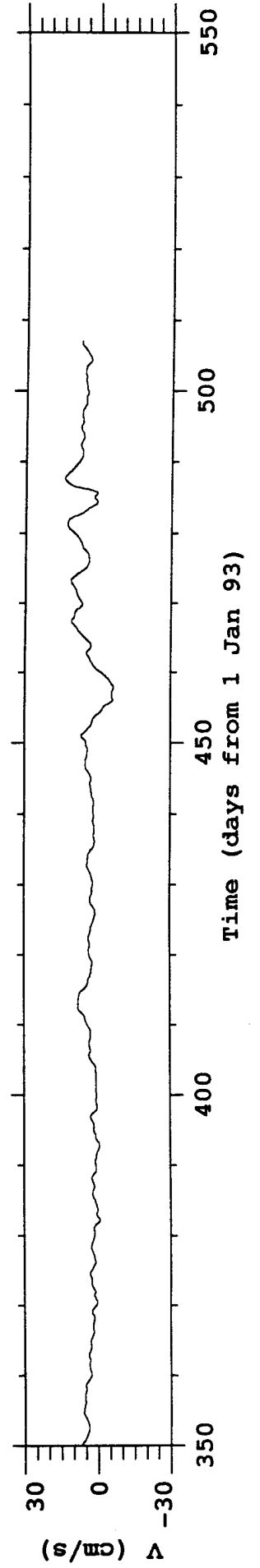
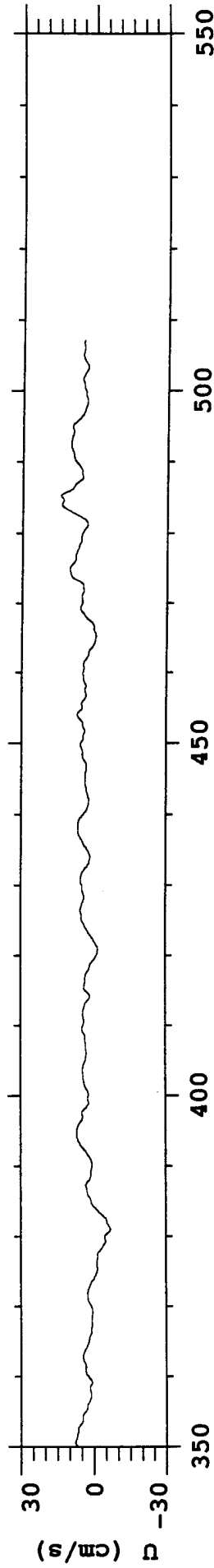
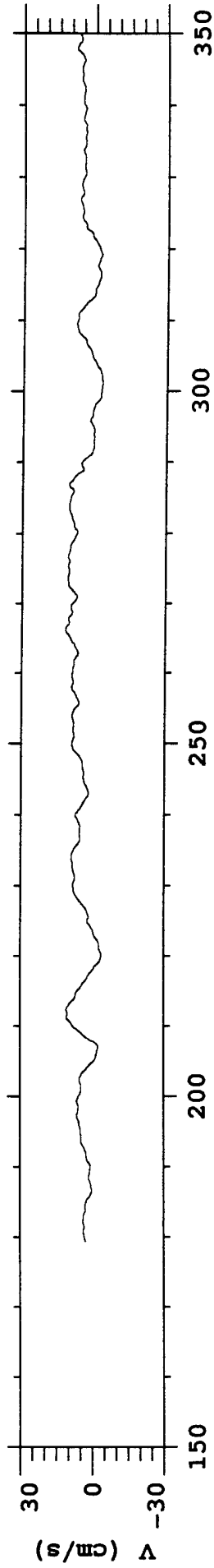
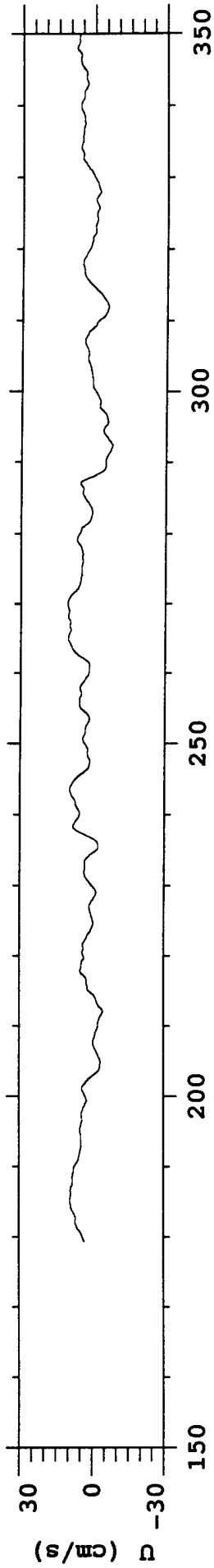
cm93d1-offset-1p



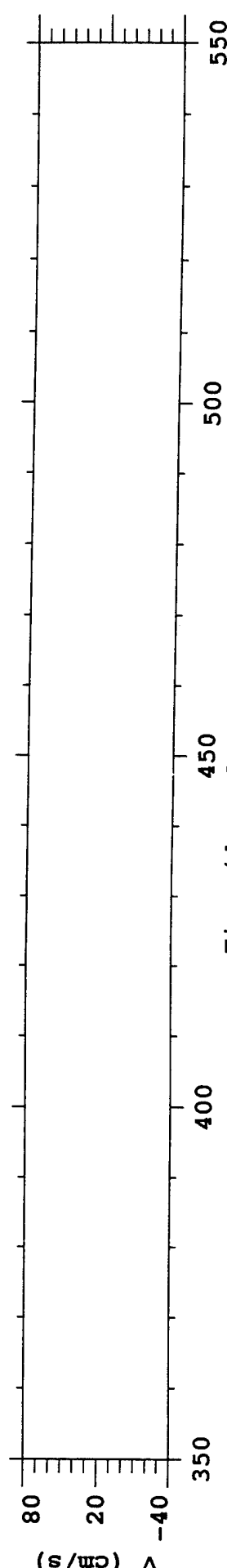
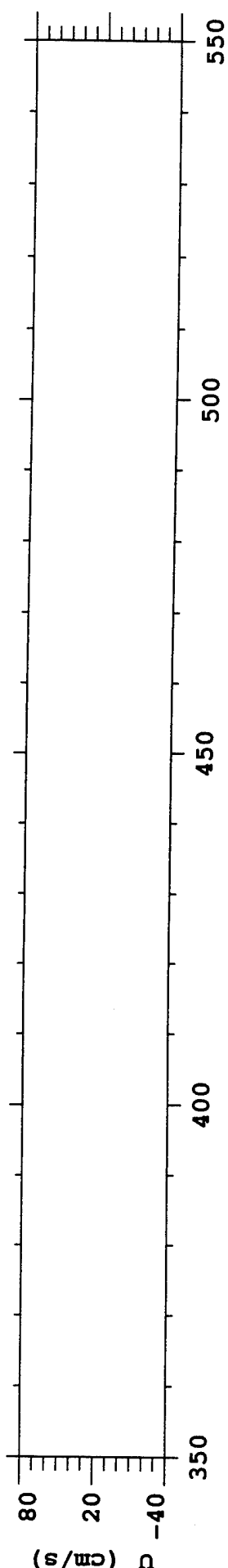
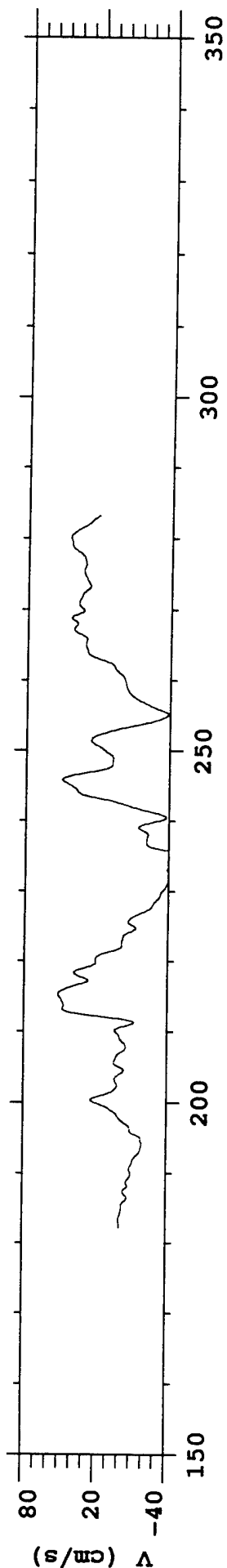
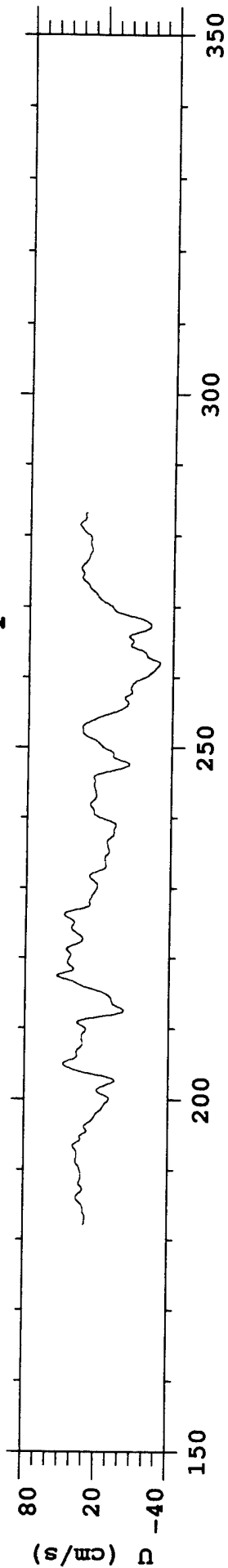
cm93d2-offset-lp



cm93d3-offset-lp

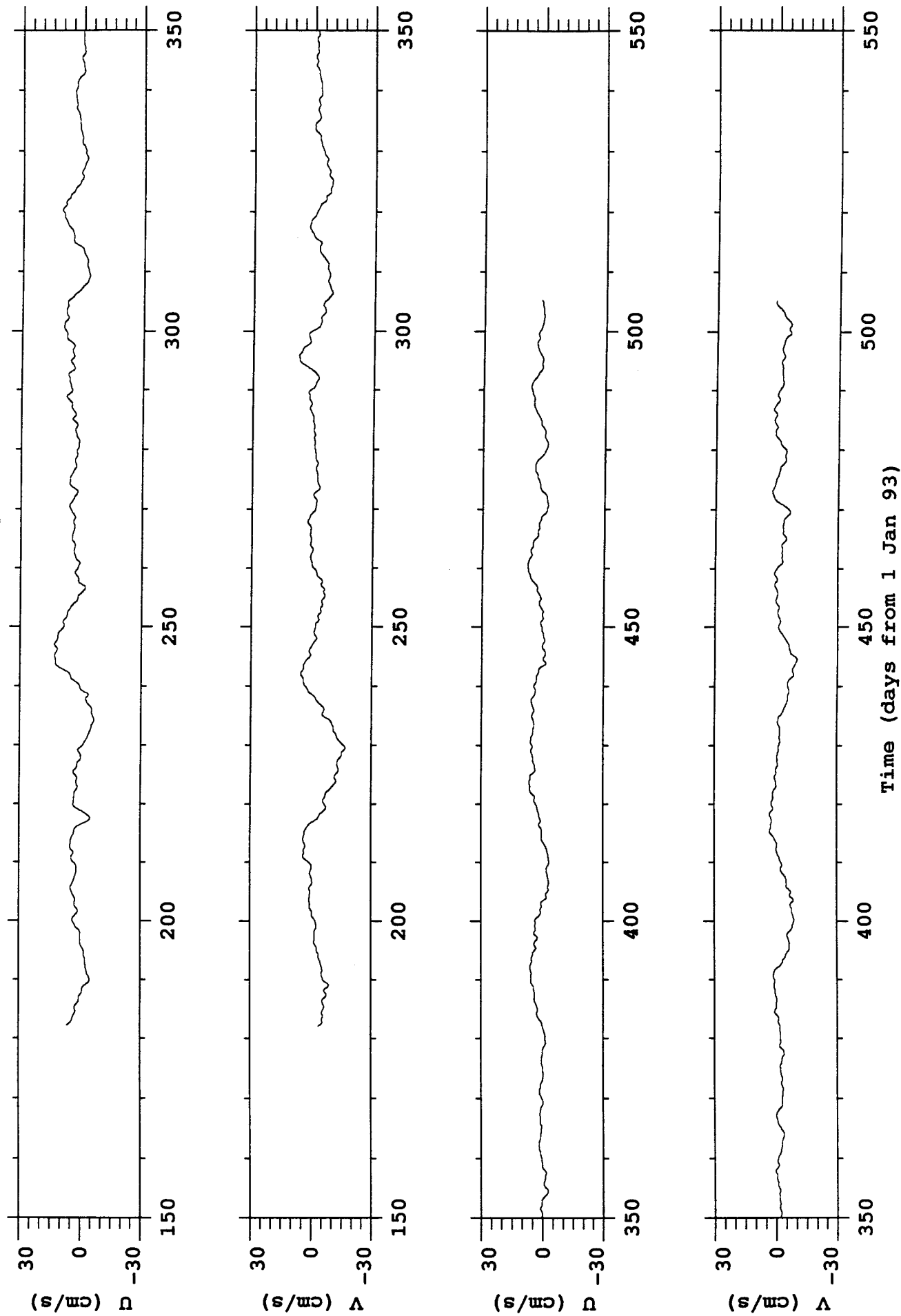


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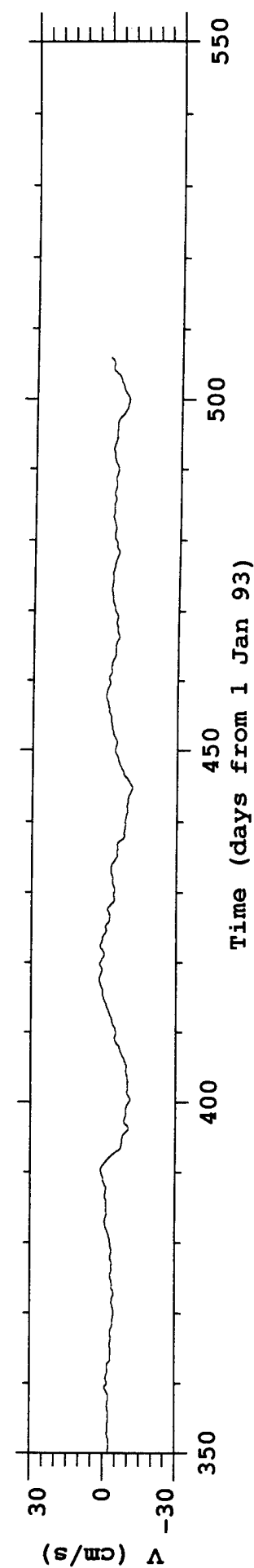
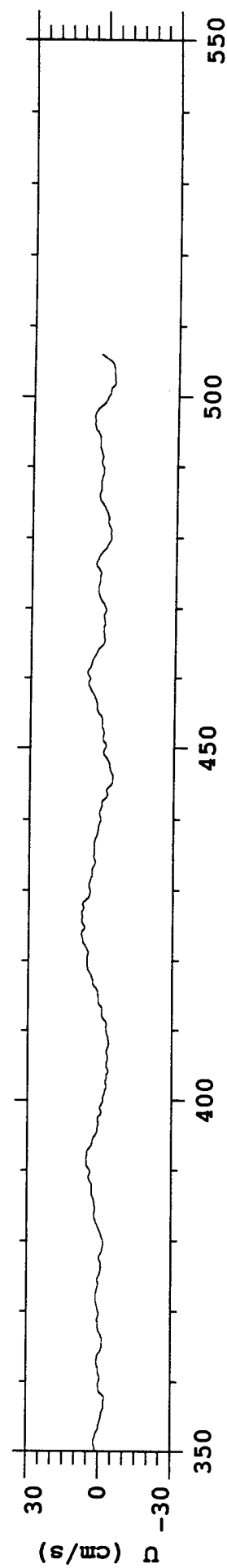
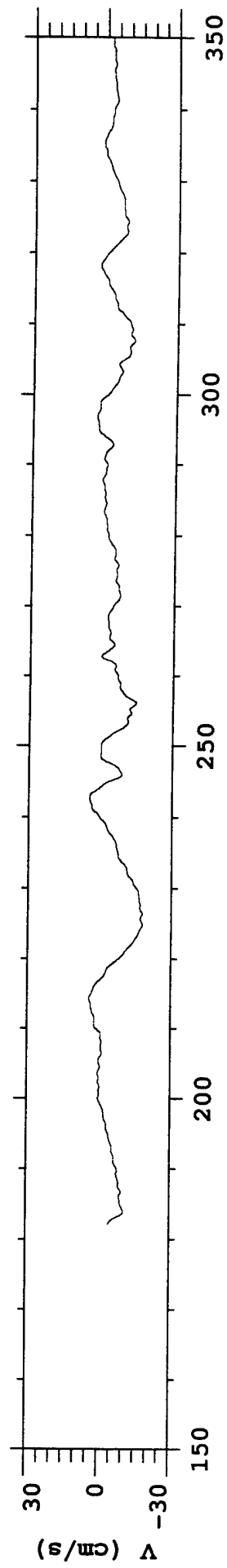
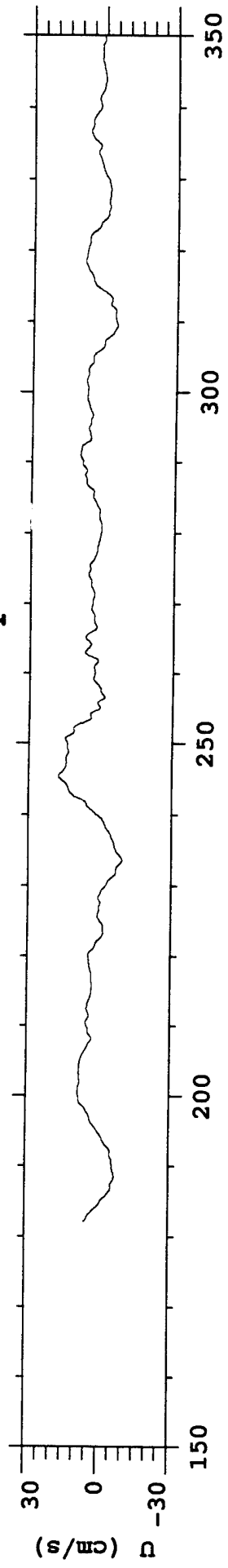


Time (days from 1 Jan 93)

cm93e2-offset-lp

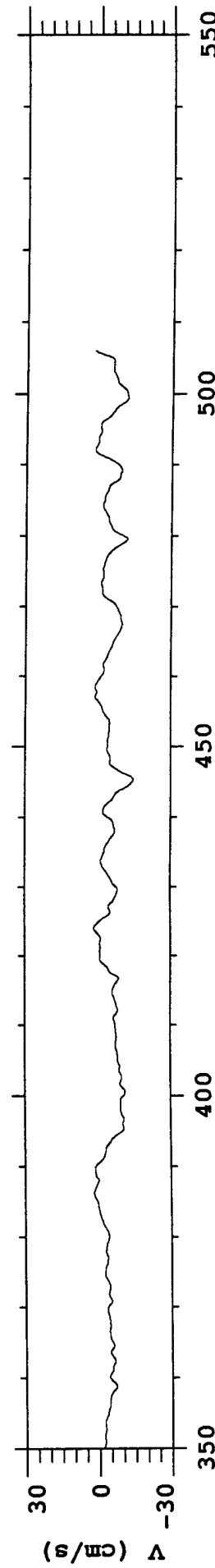
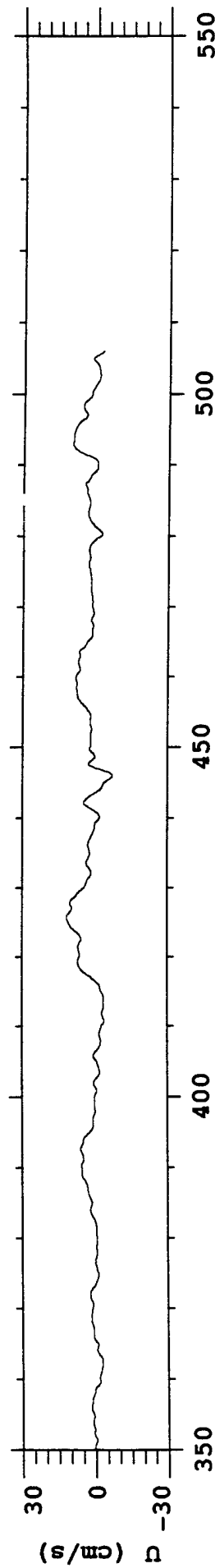
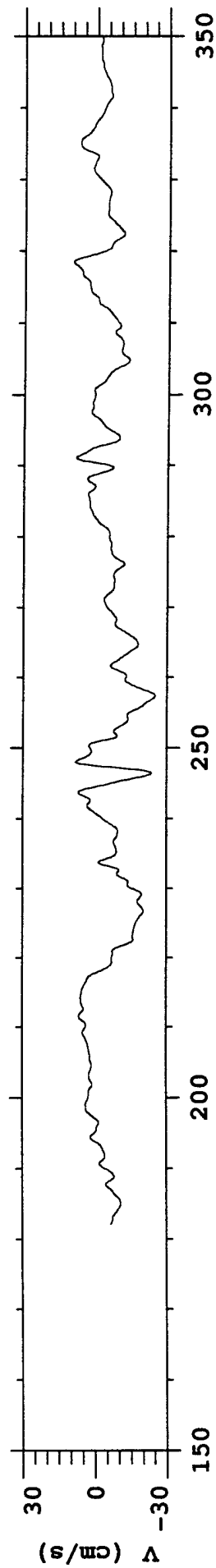
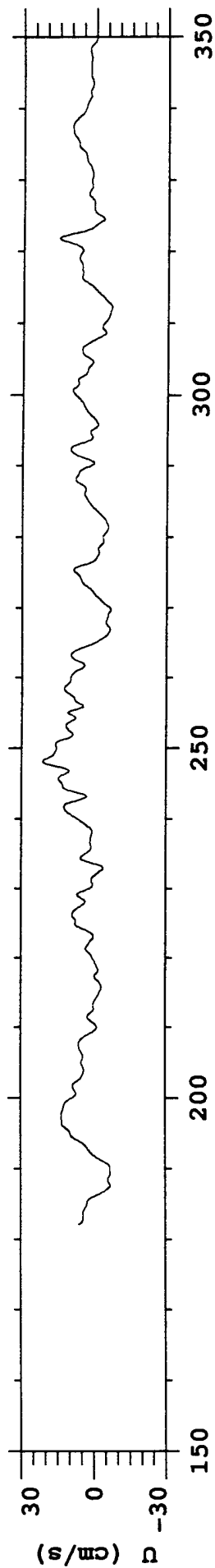


cm93e3-offset-1p



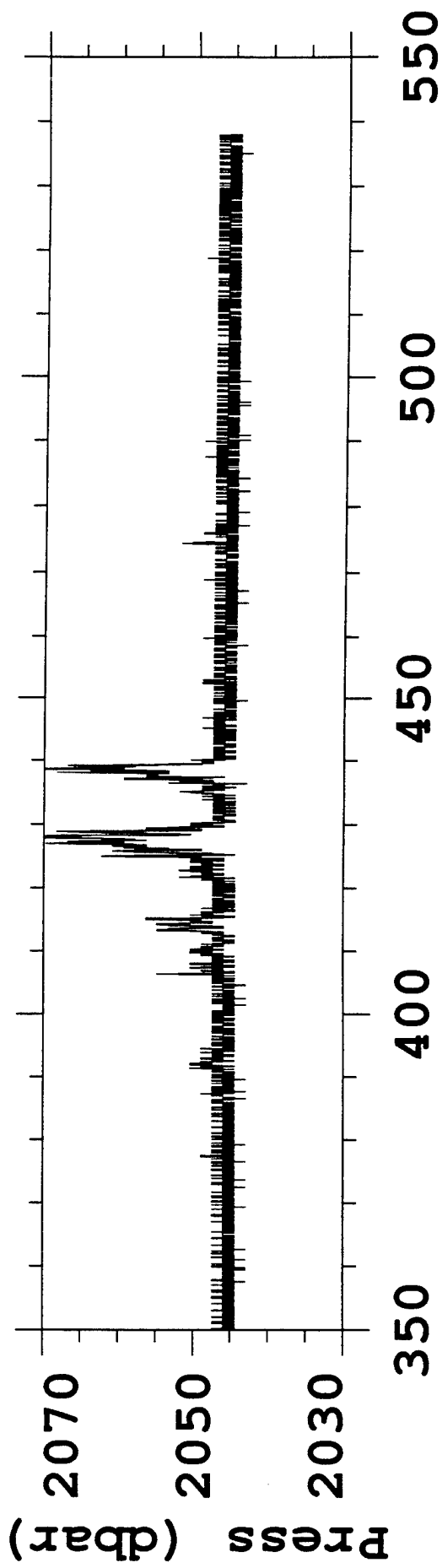
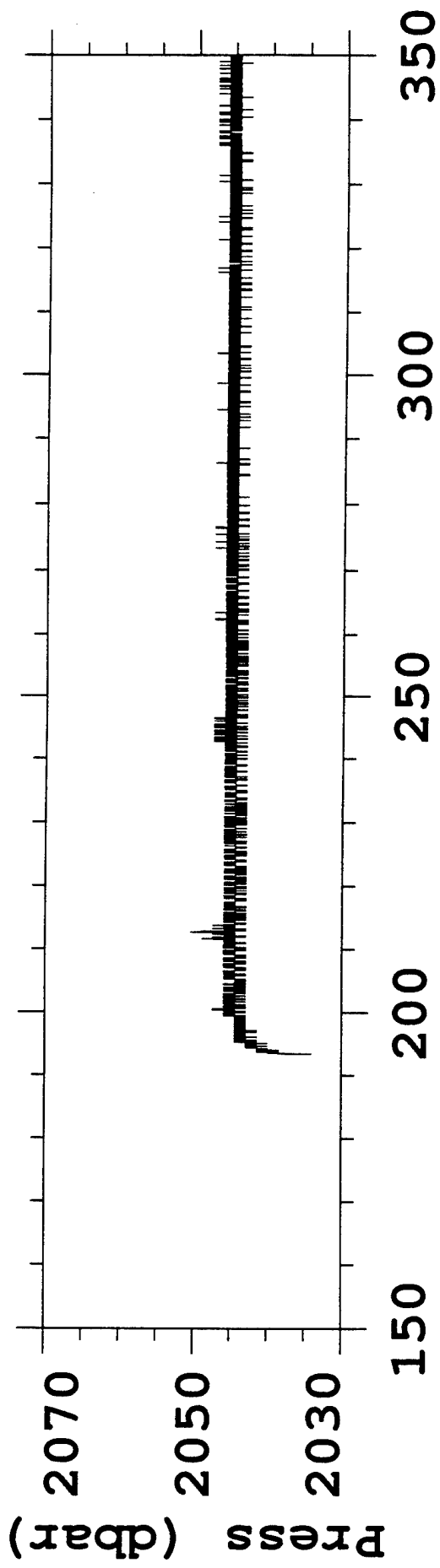
Time (days from 1 Jan 93)

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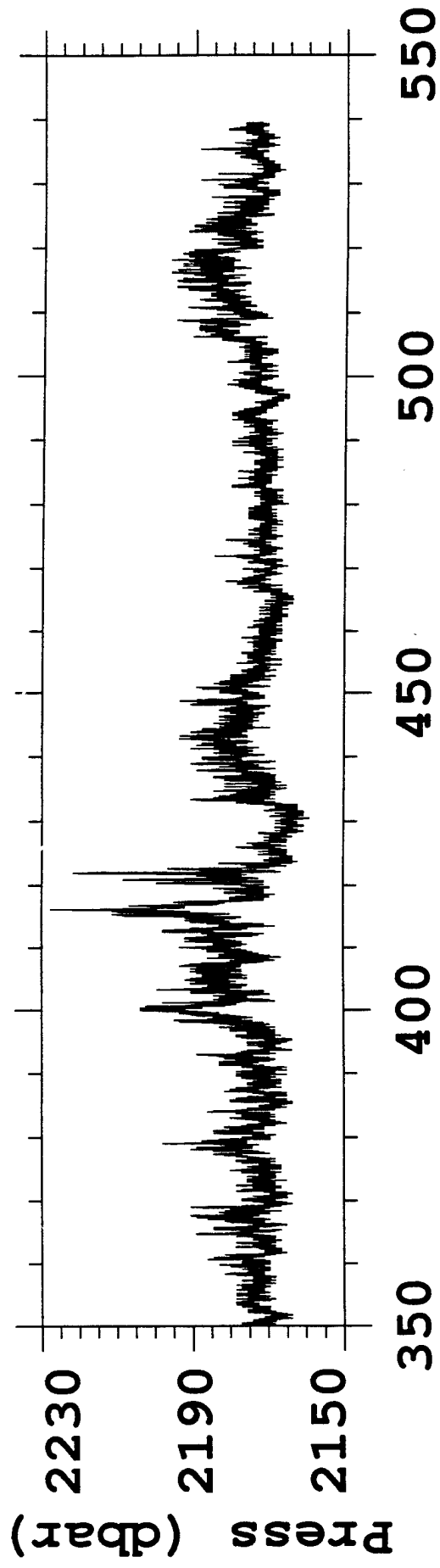
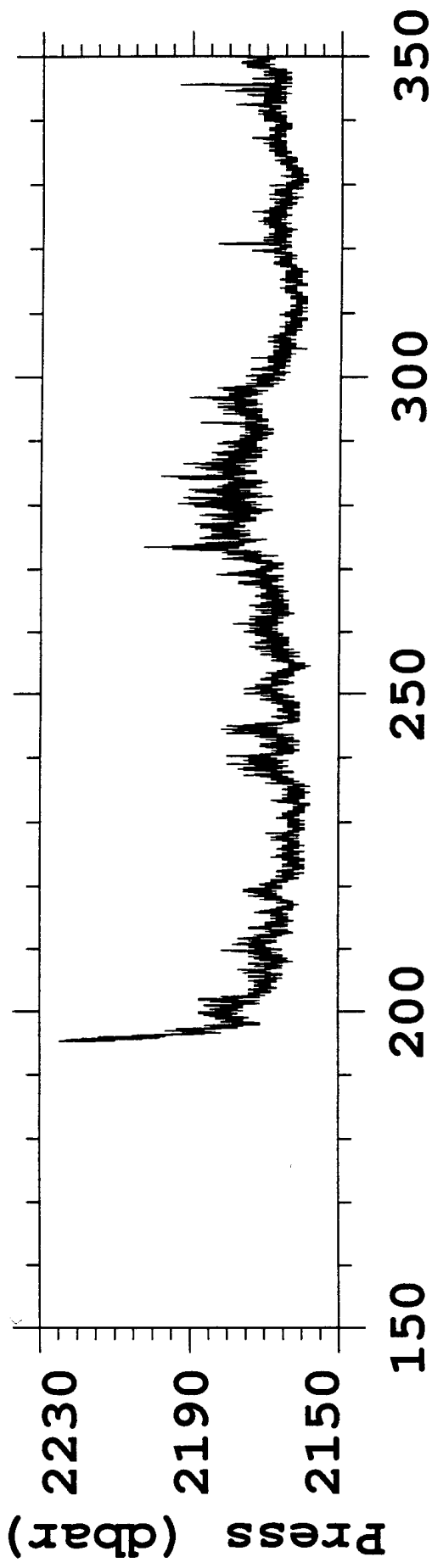


Time (days from 1 Jan 93)

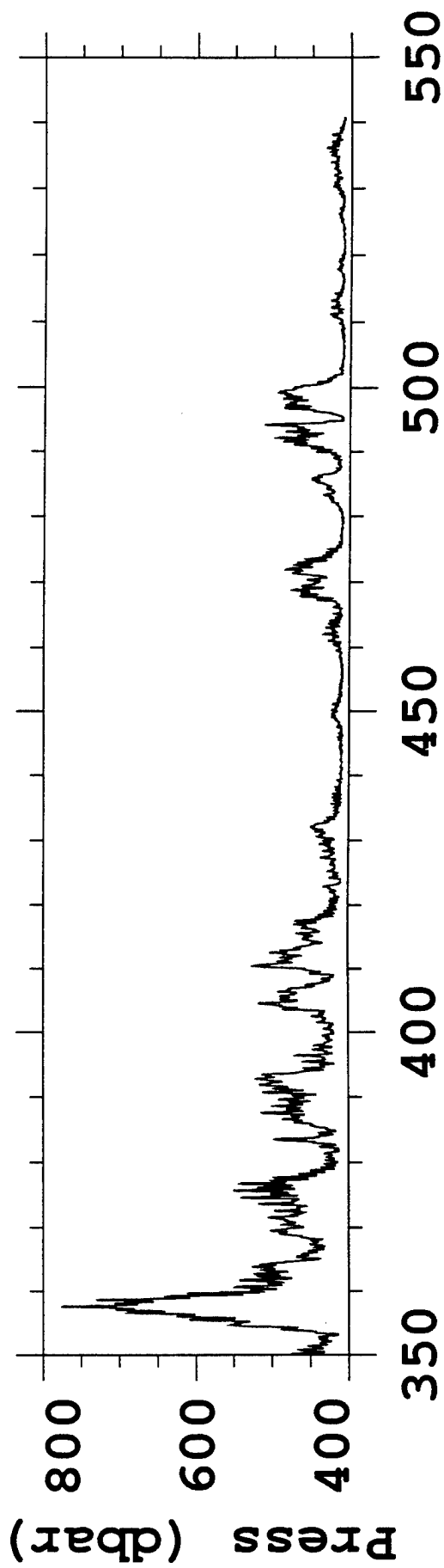
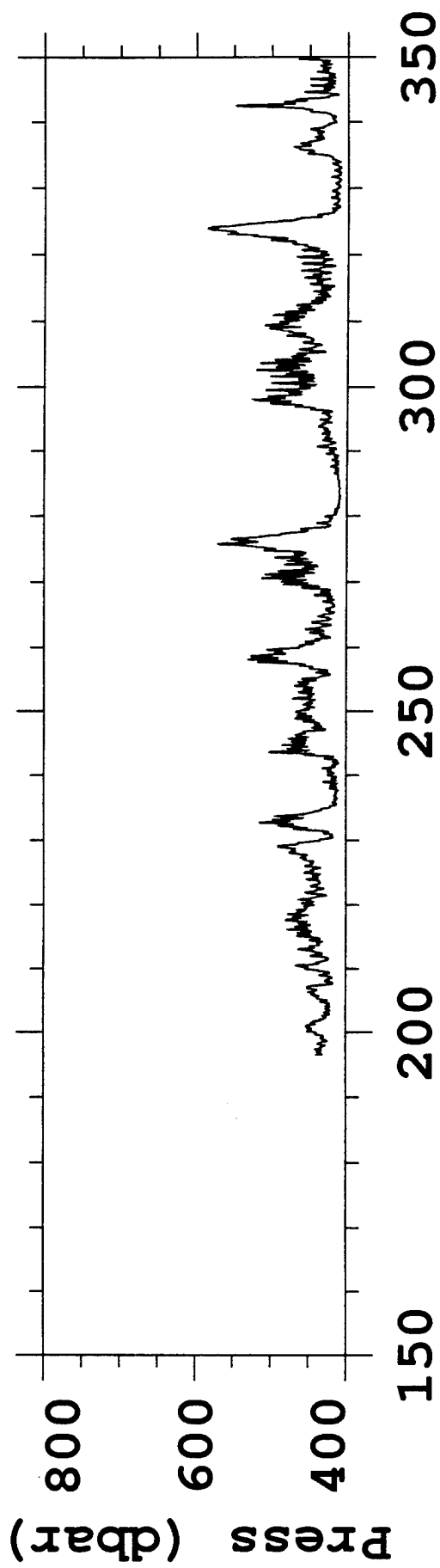
cm92b1



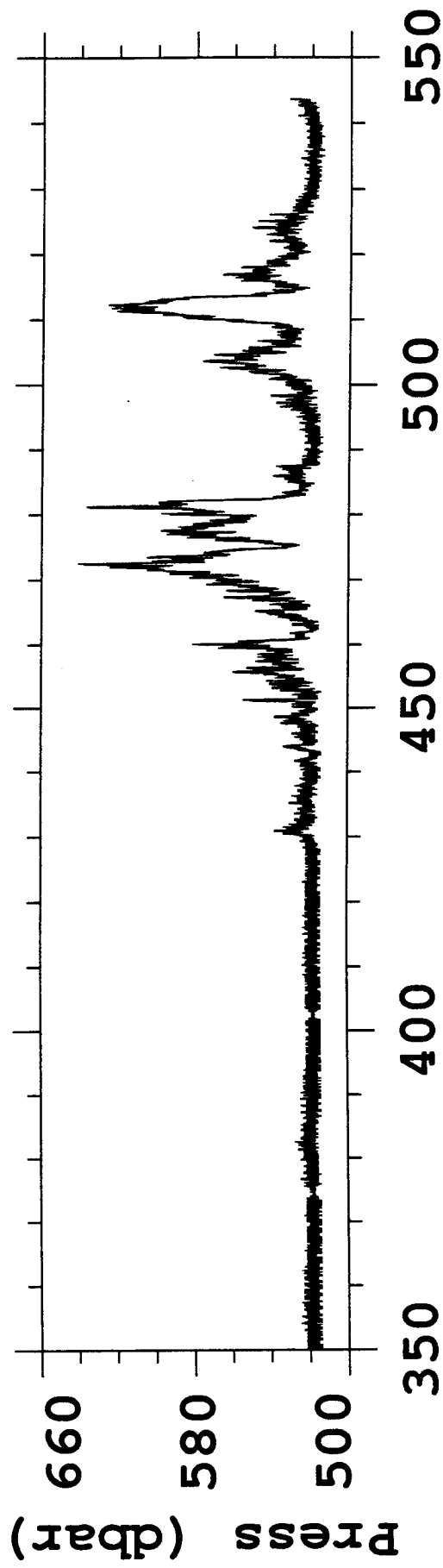
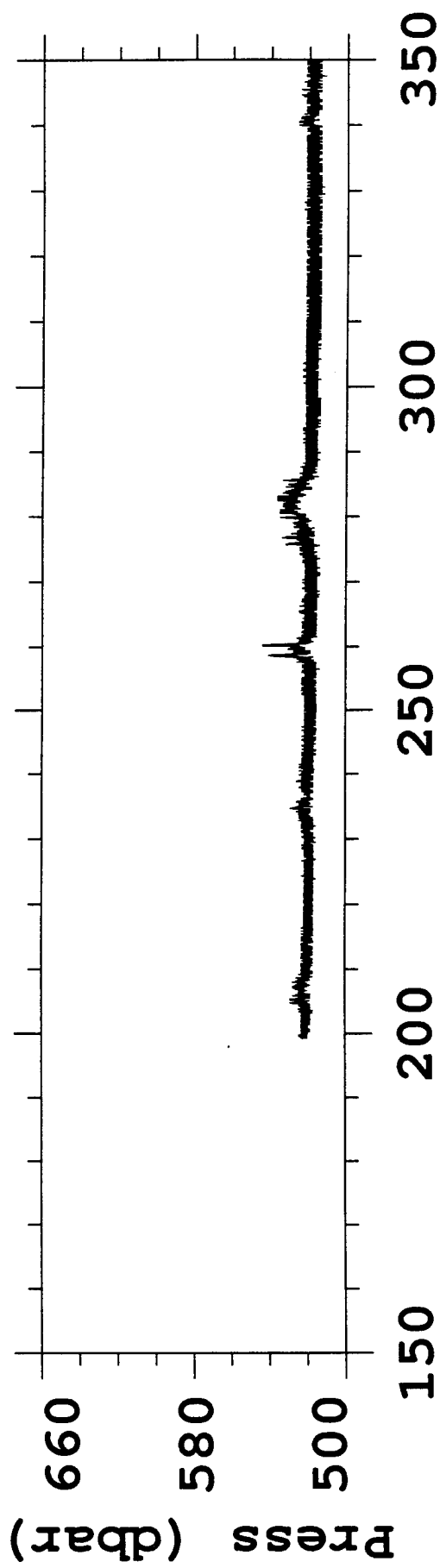
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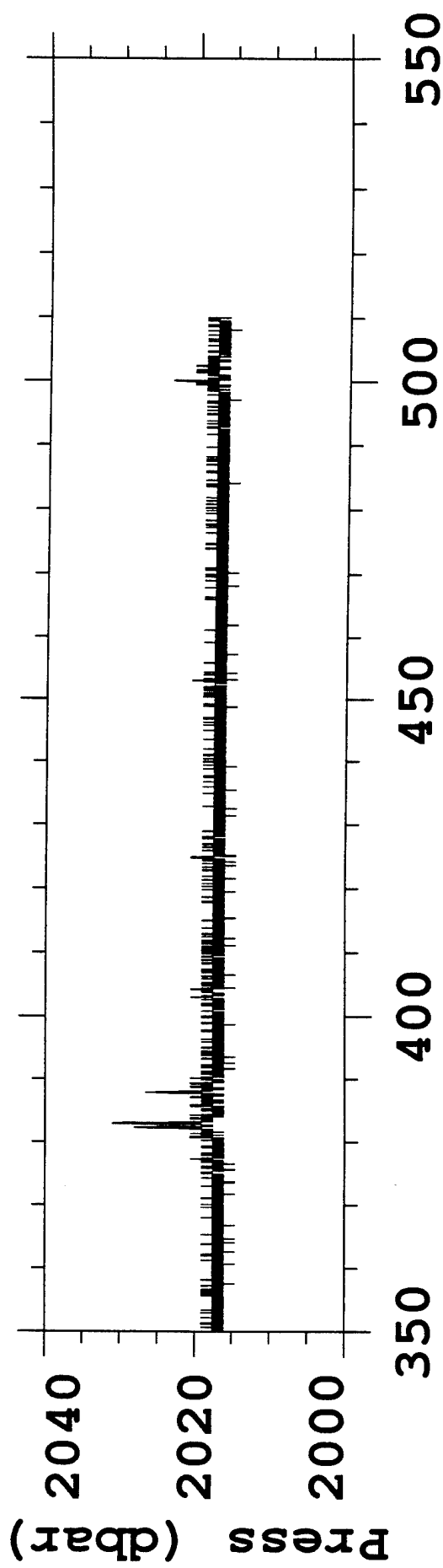
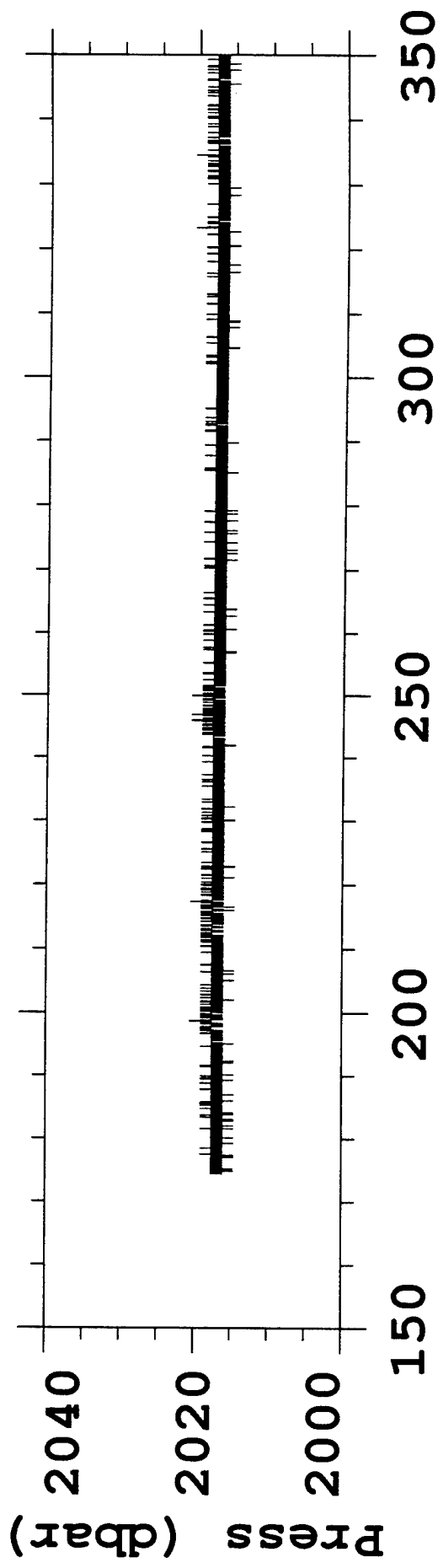
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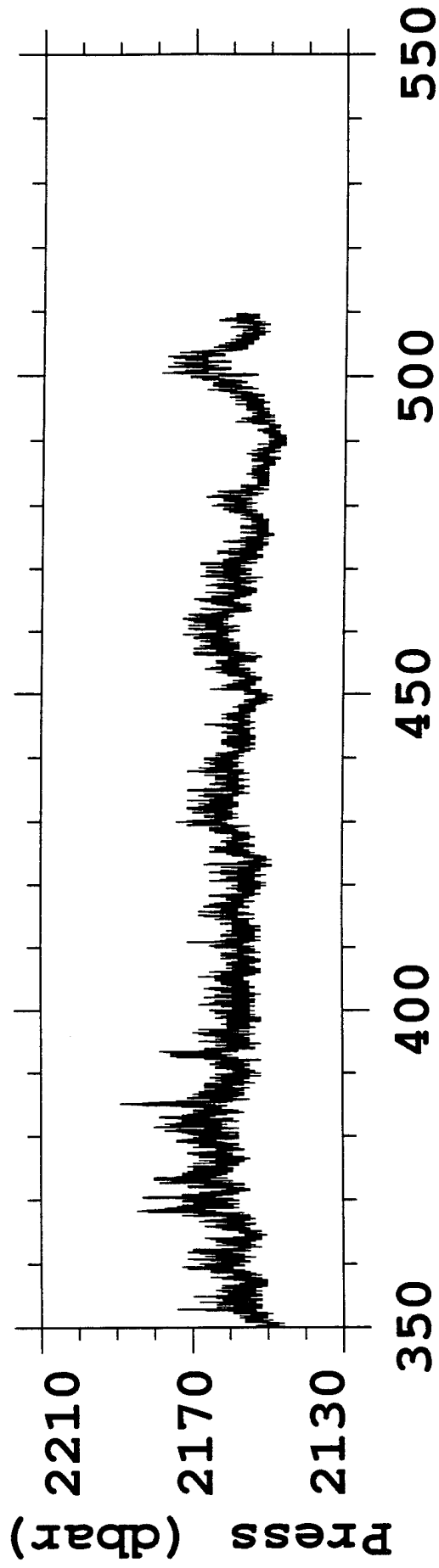
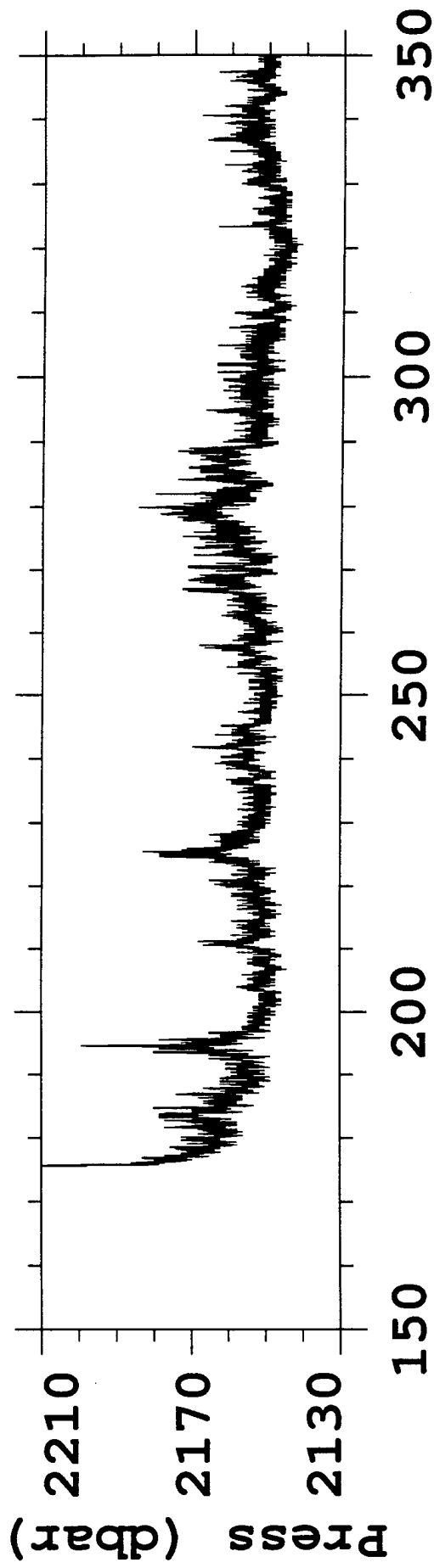
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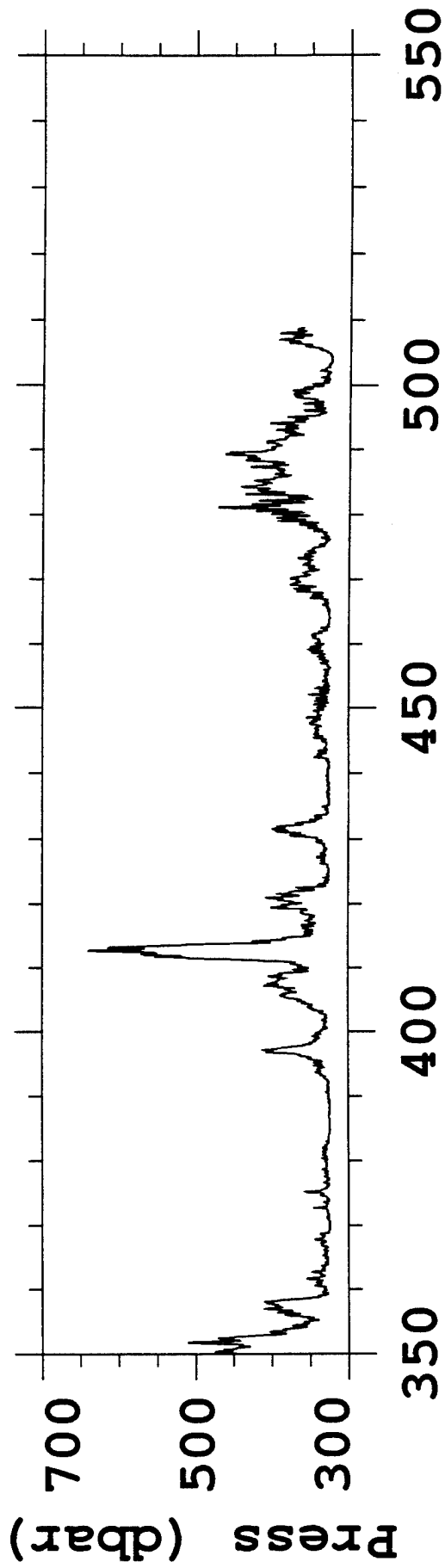
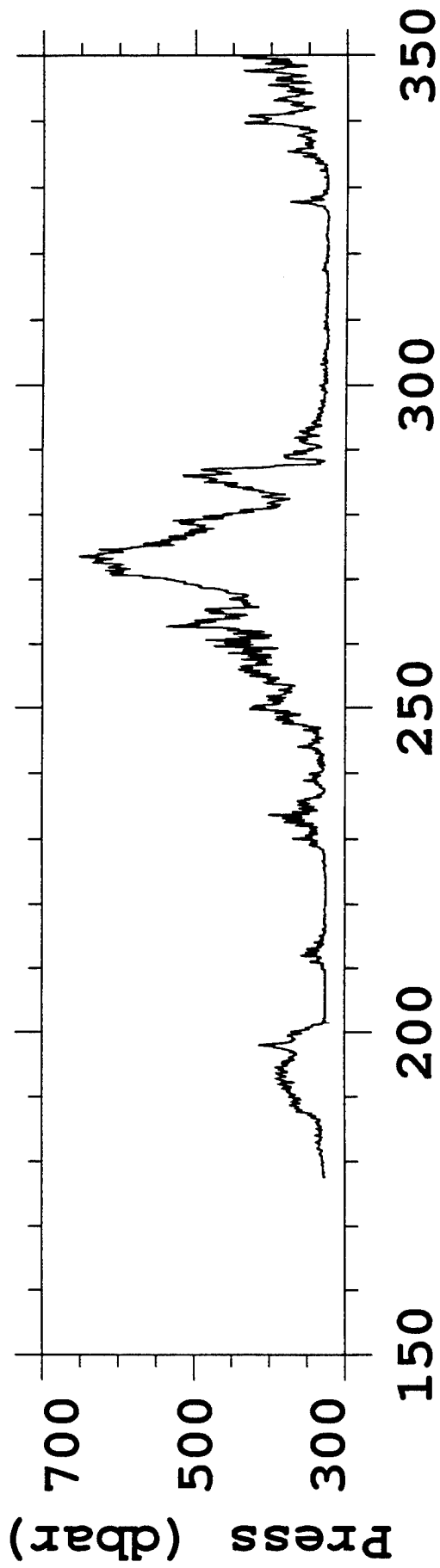
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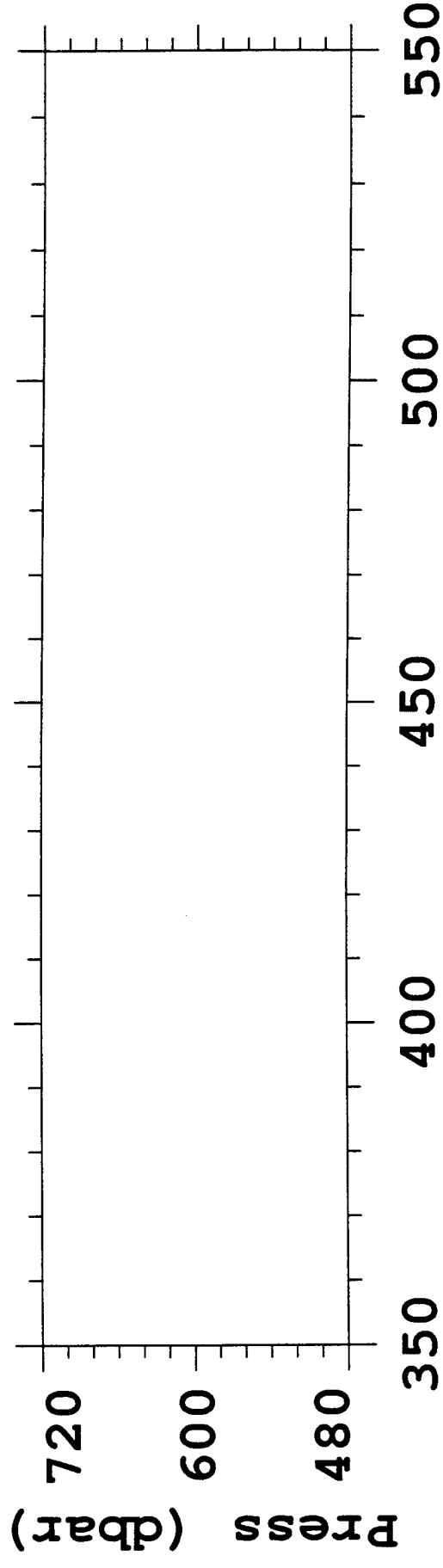
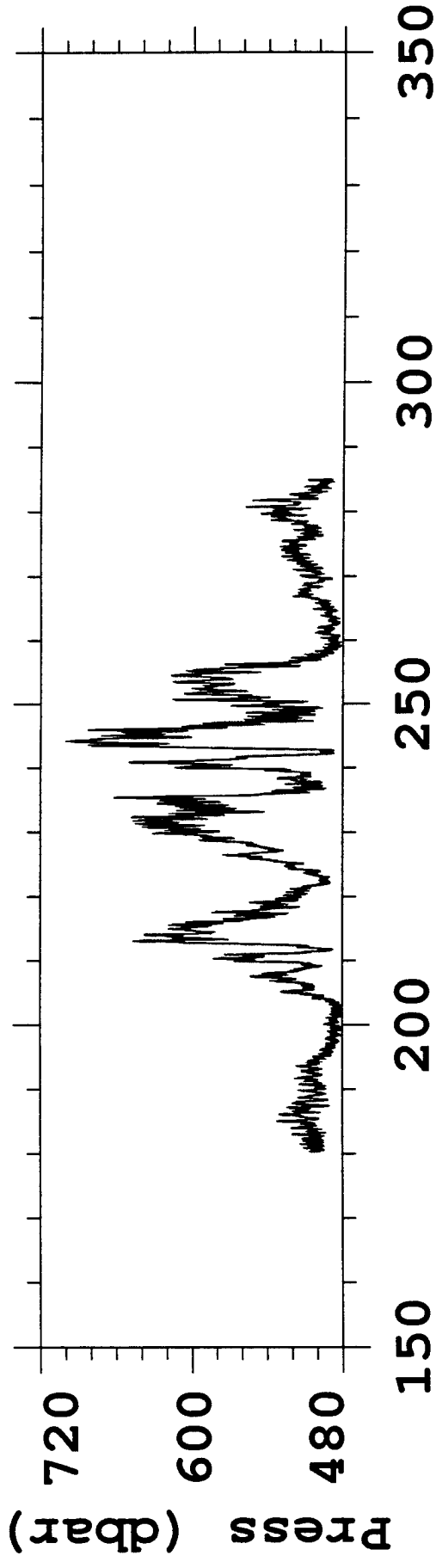
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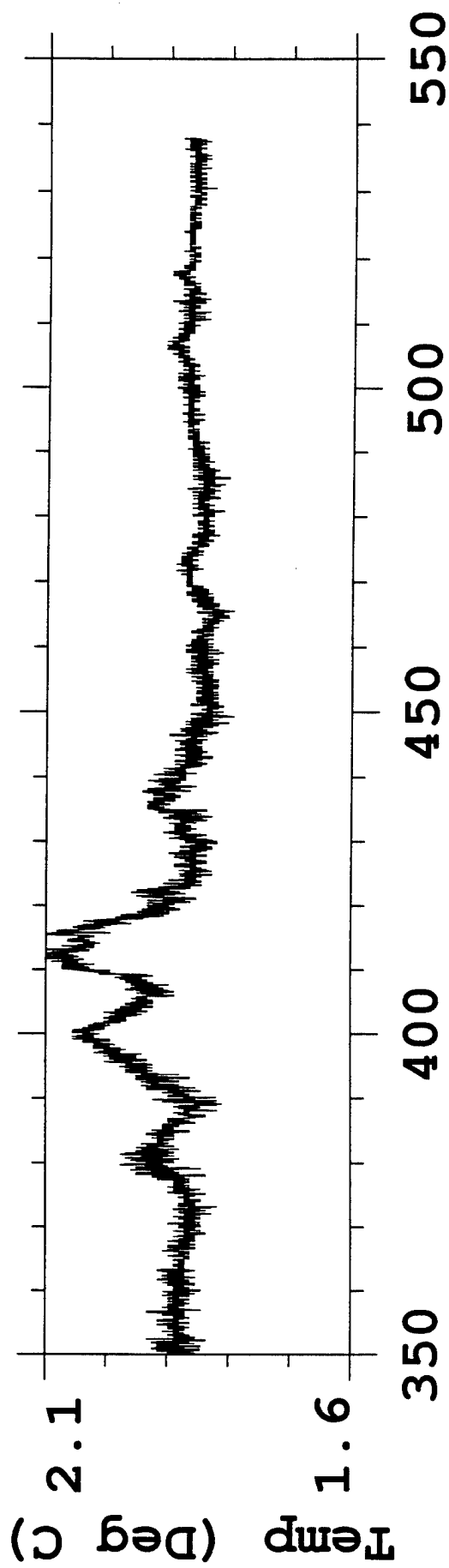
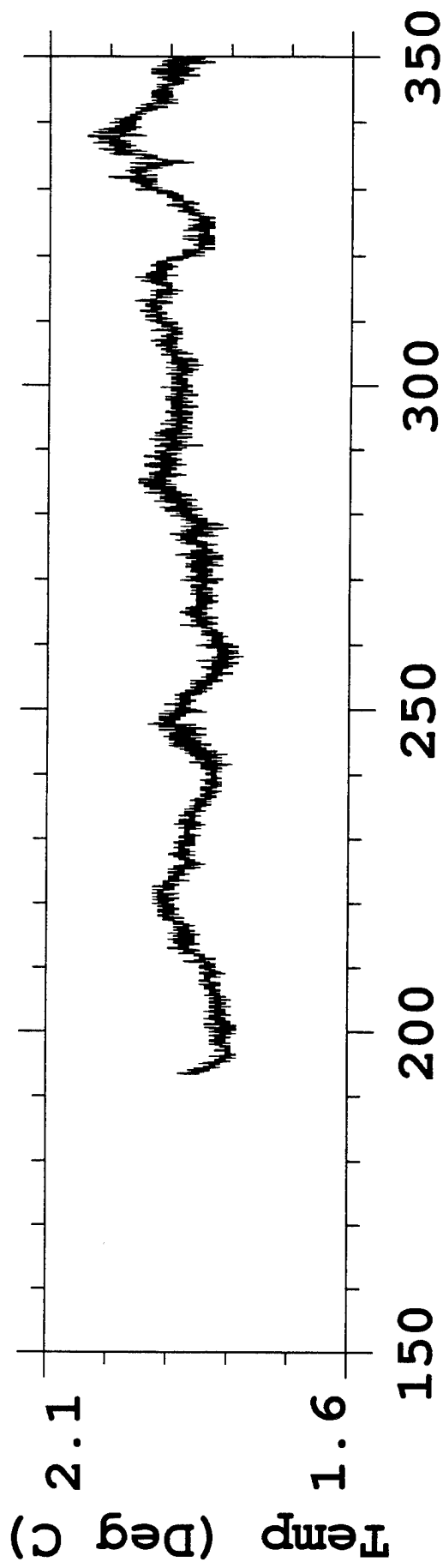
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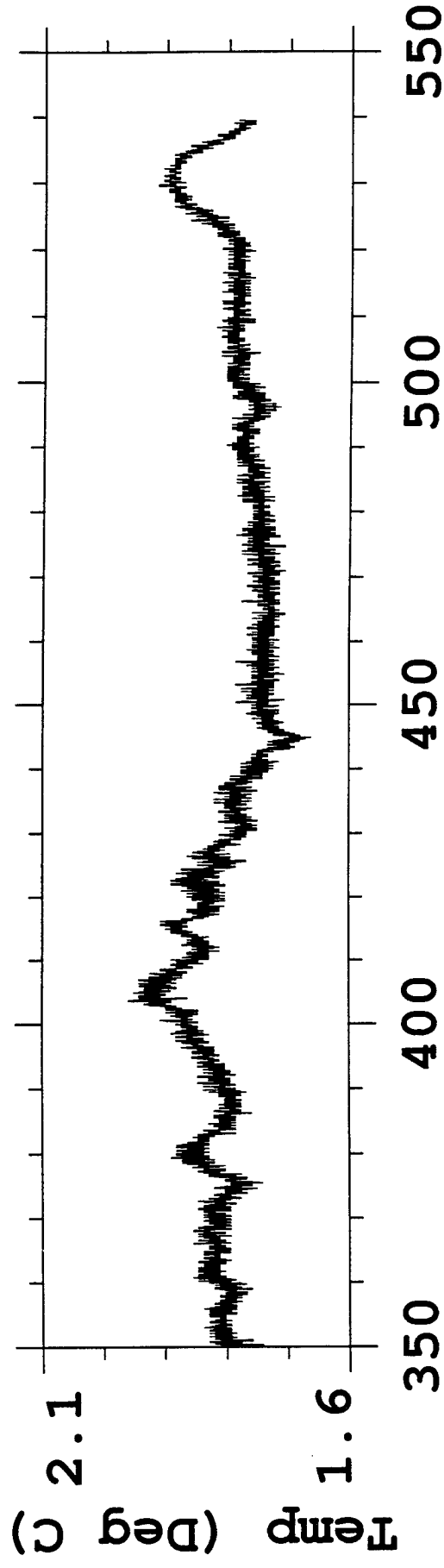
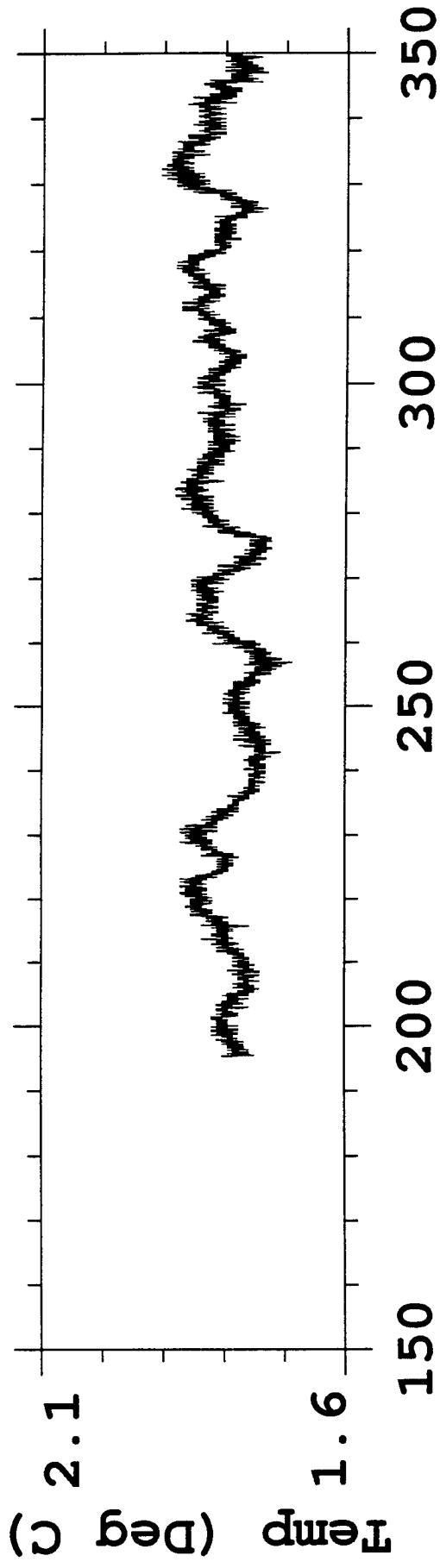
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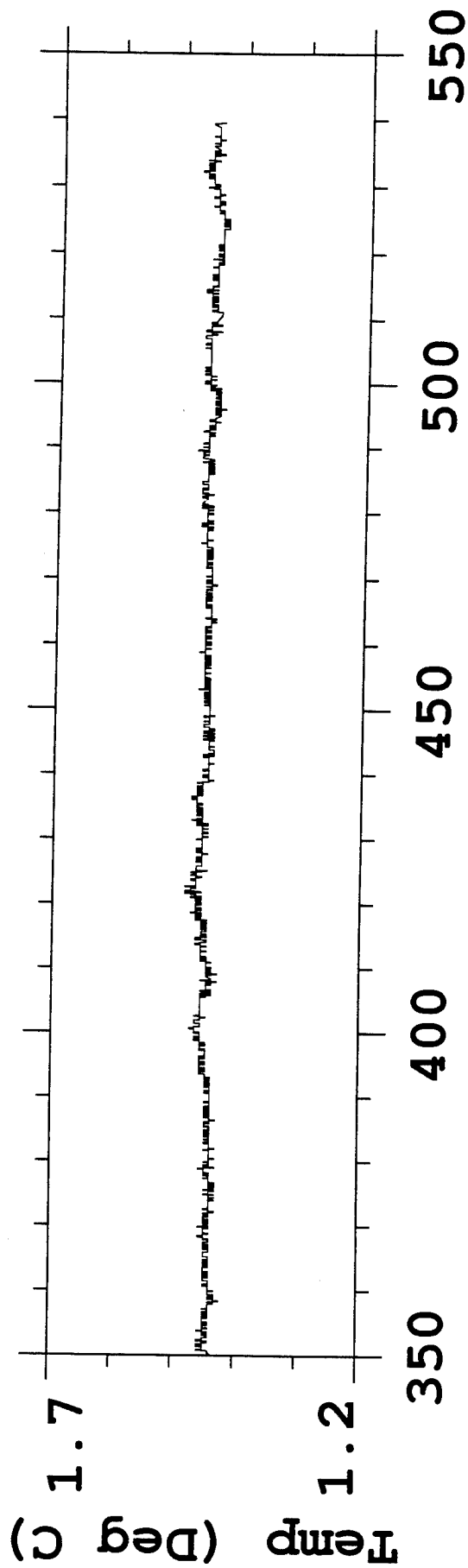
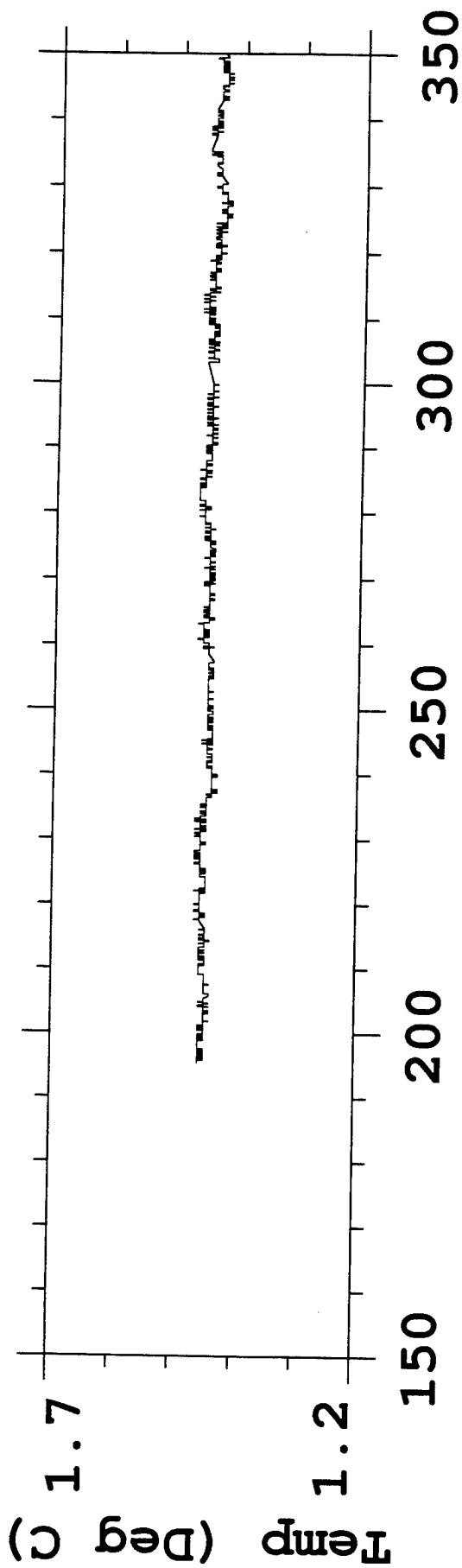
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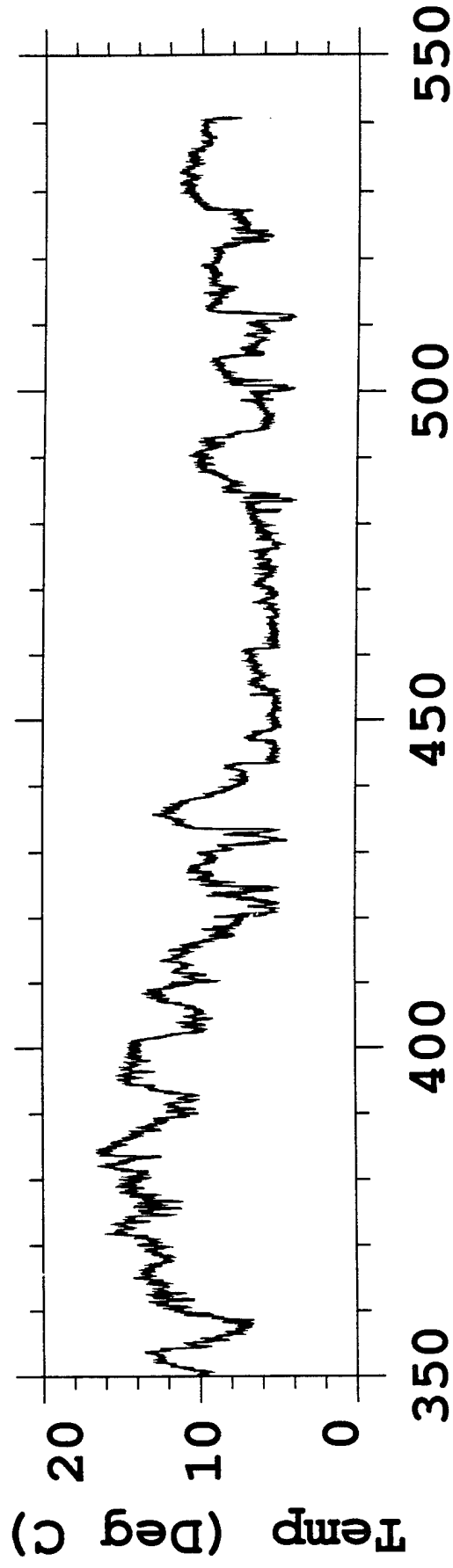
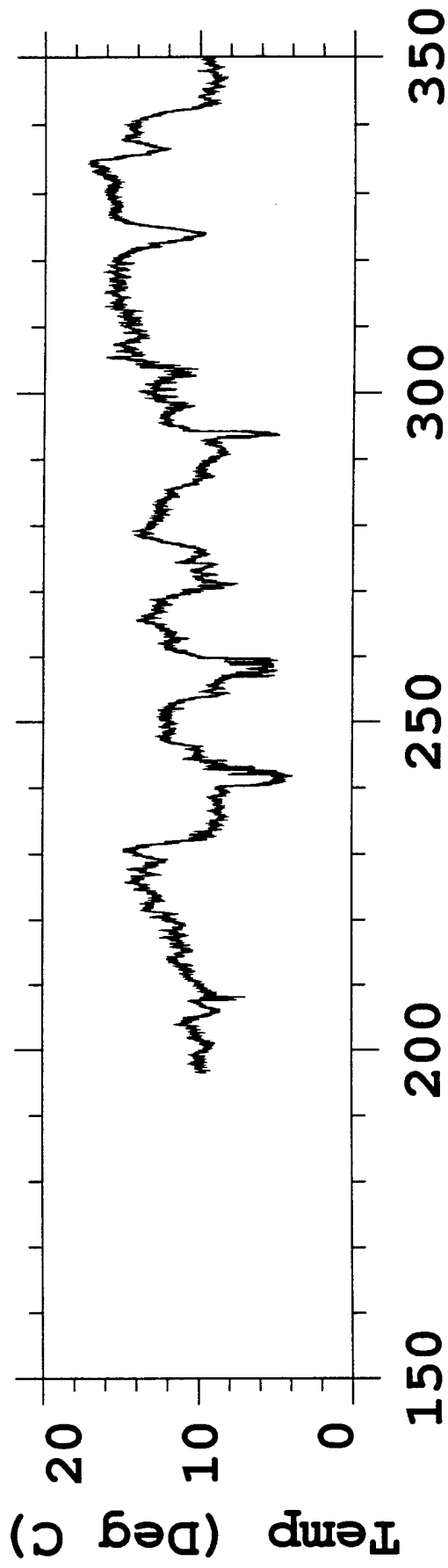
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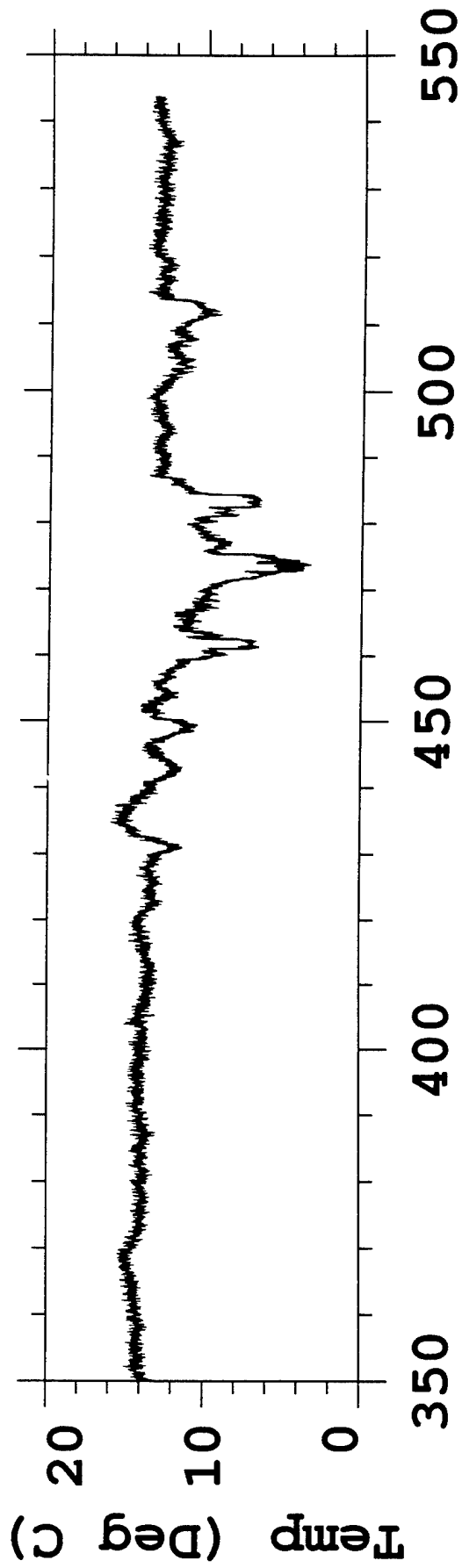
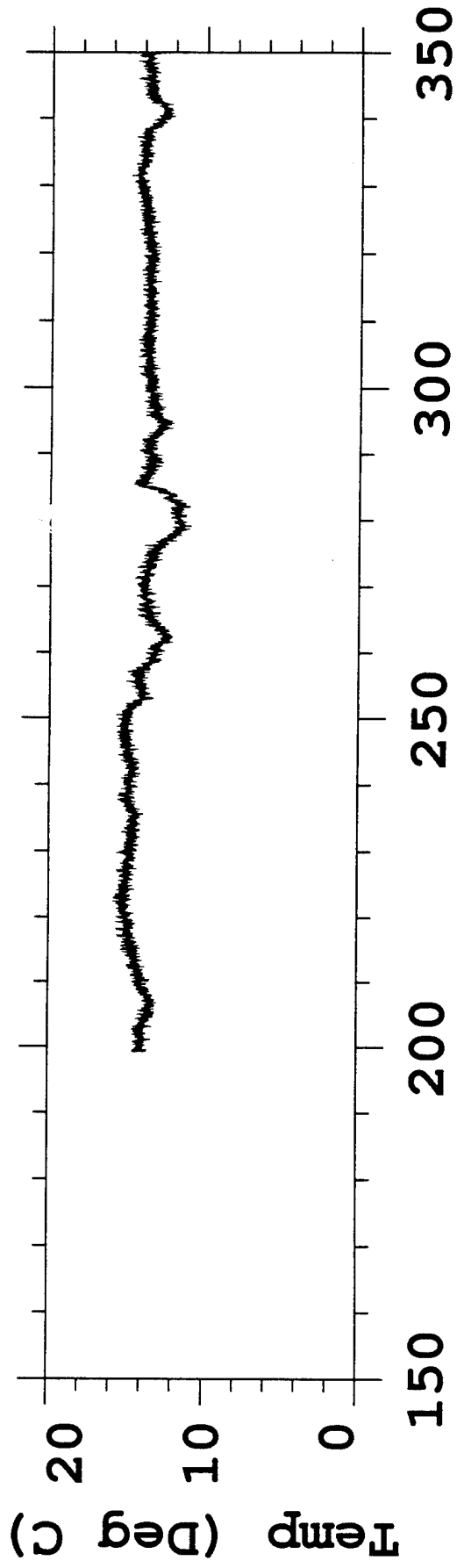
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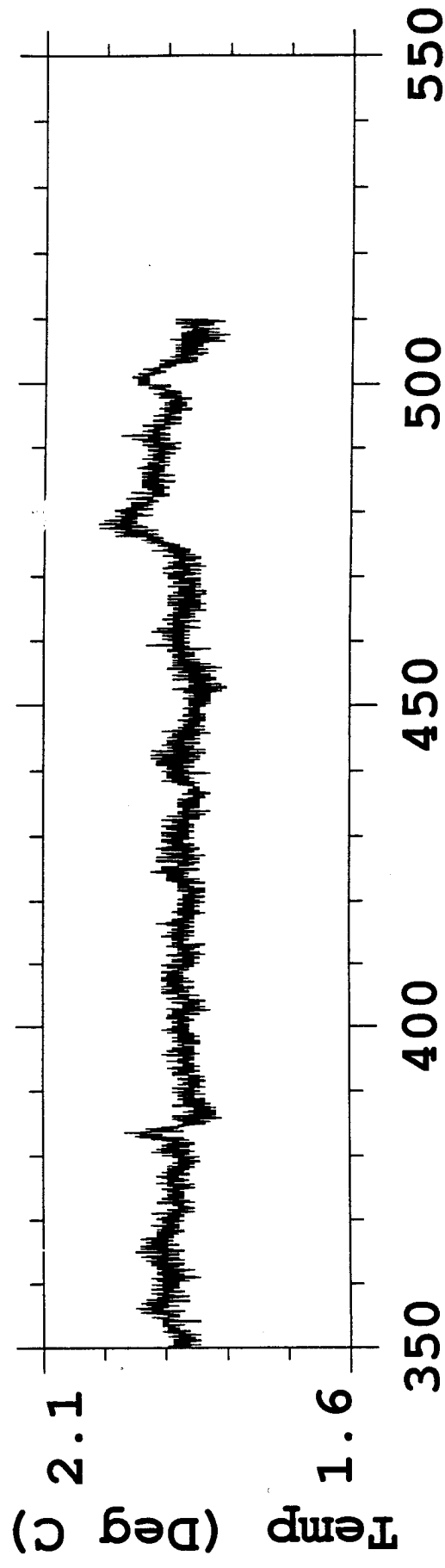
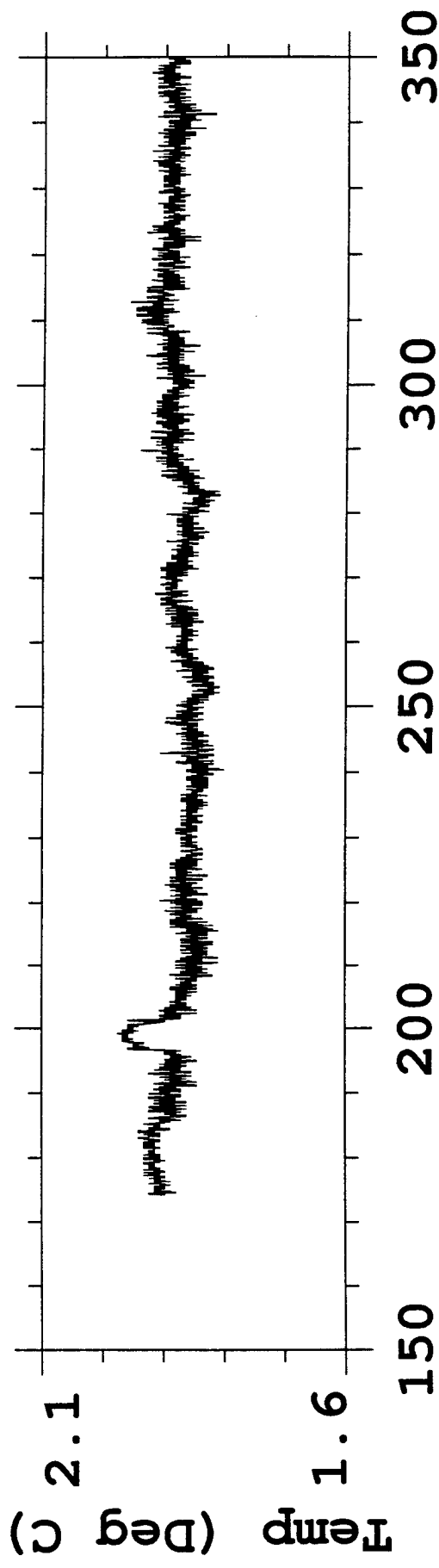
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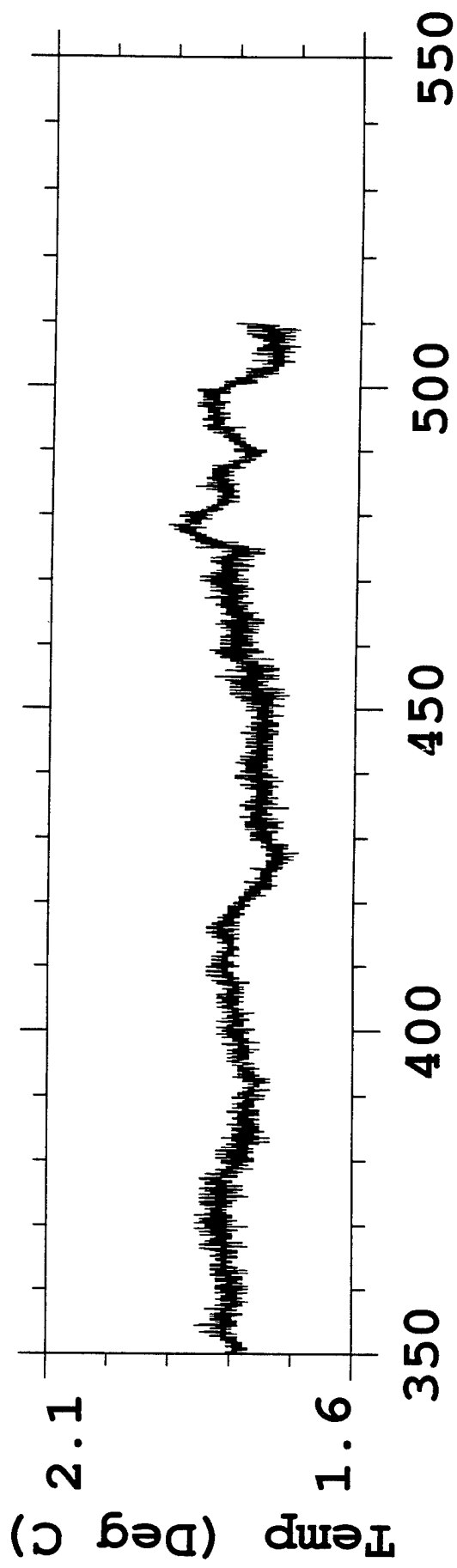
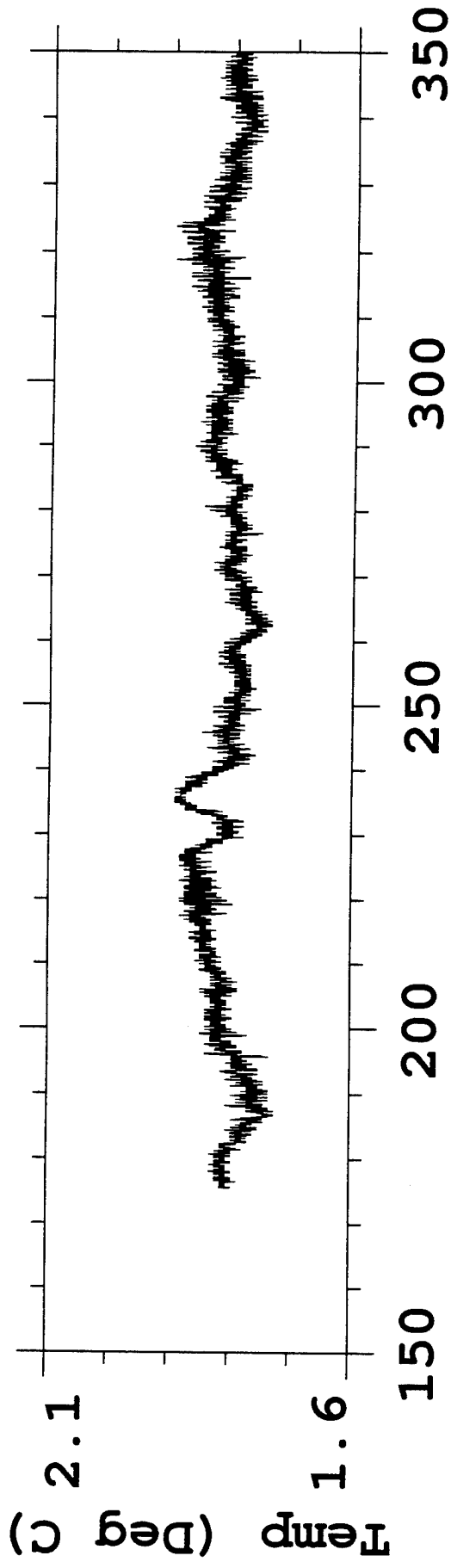
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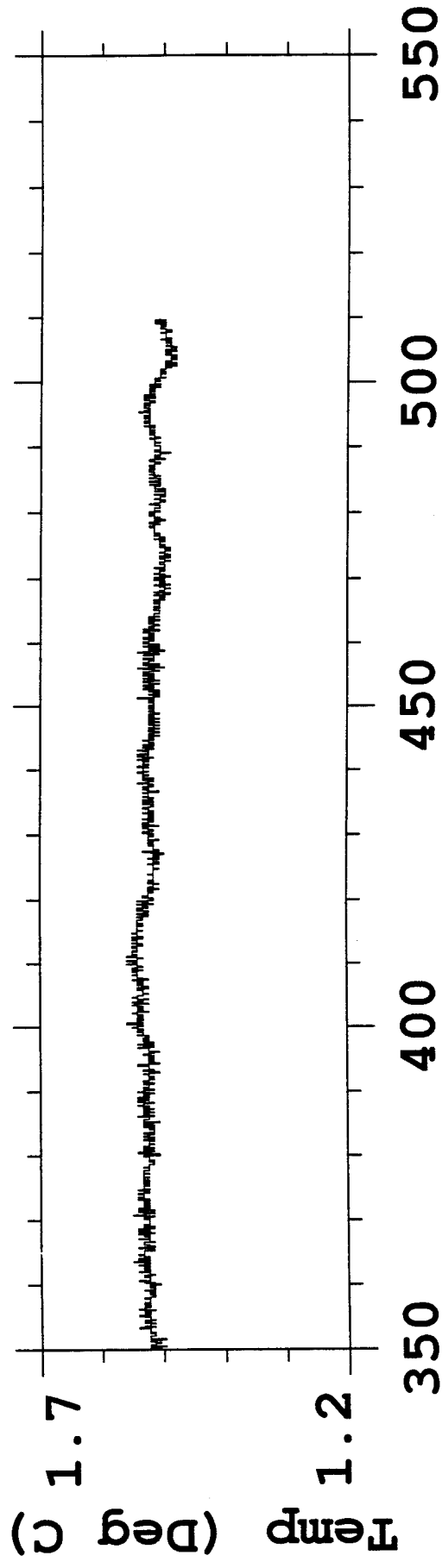
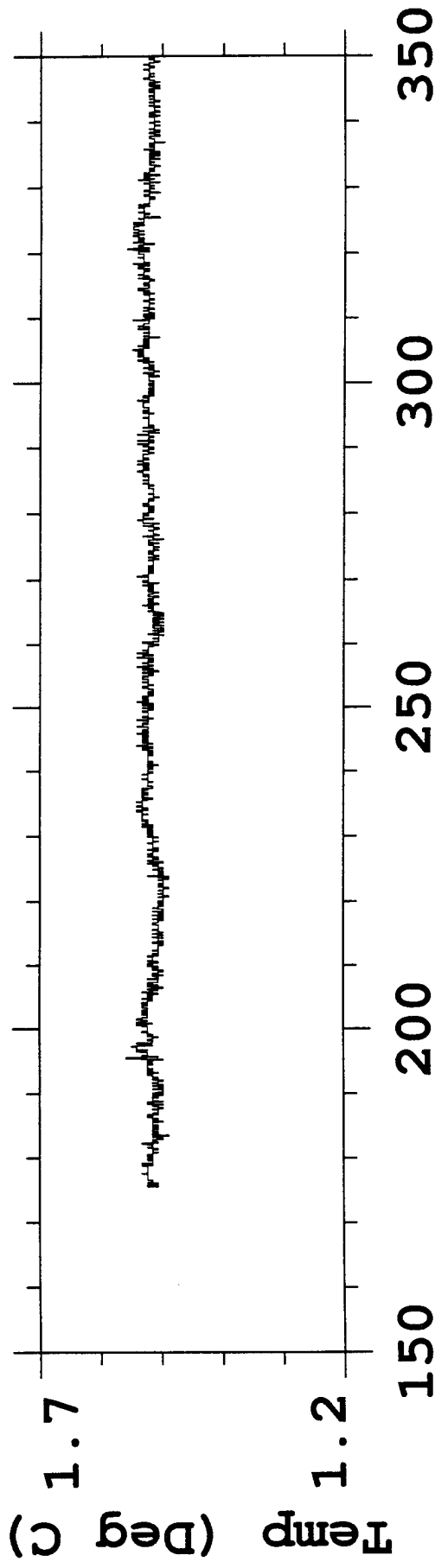
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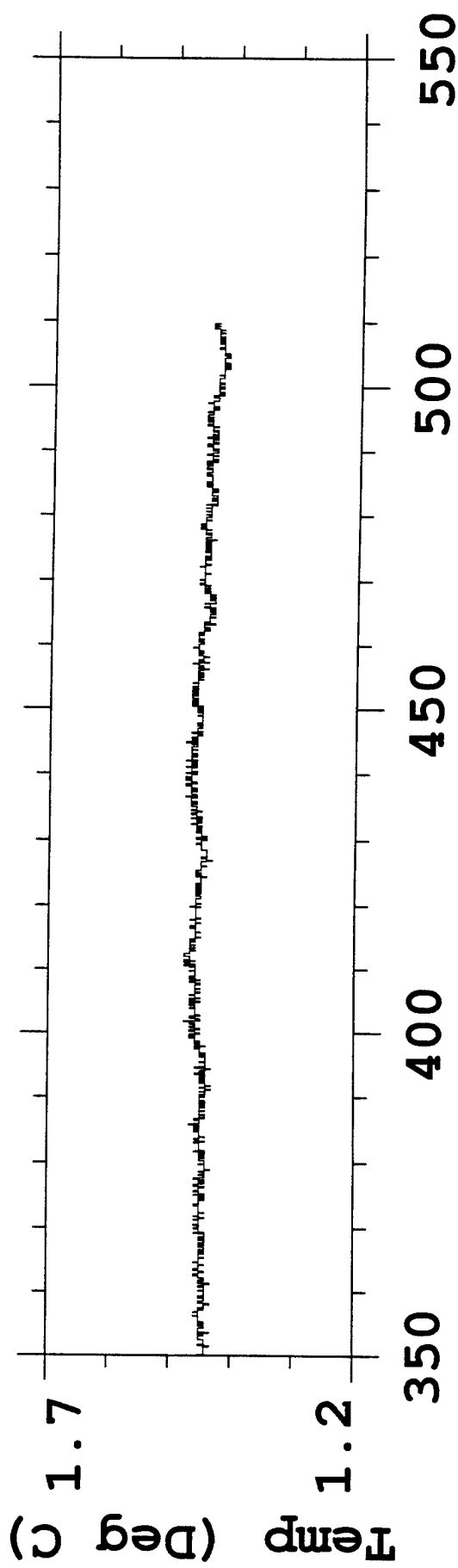
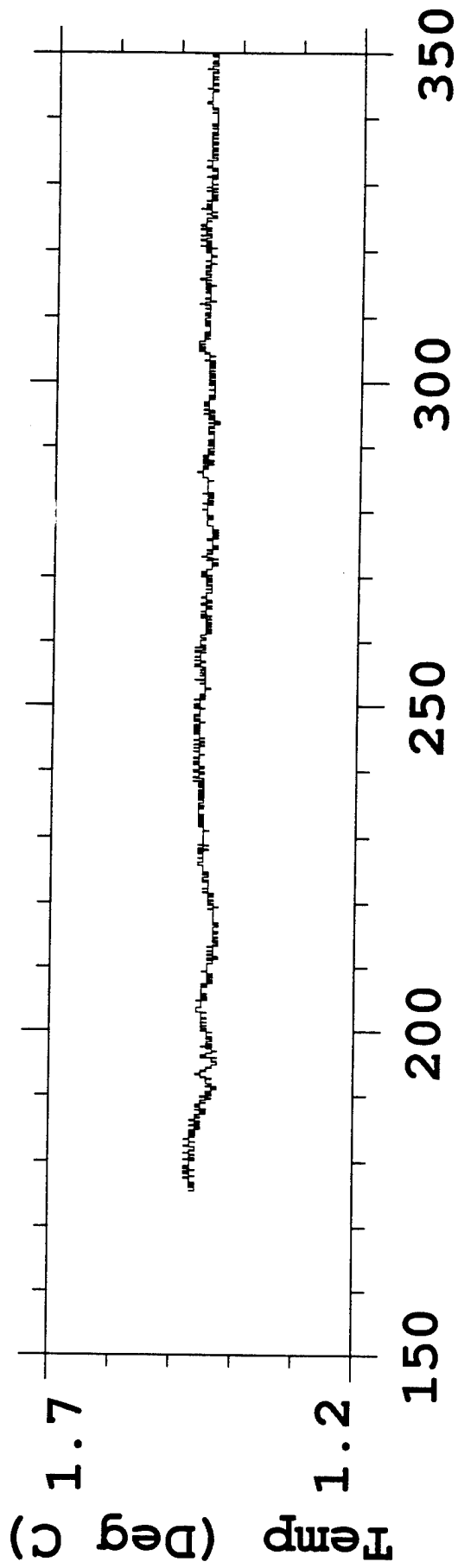
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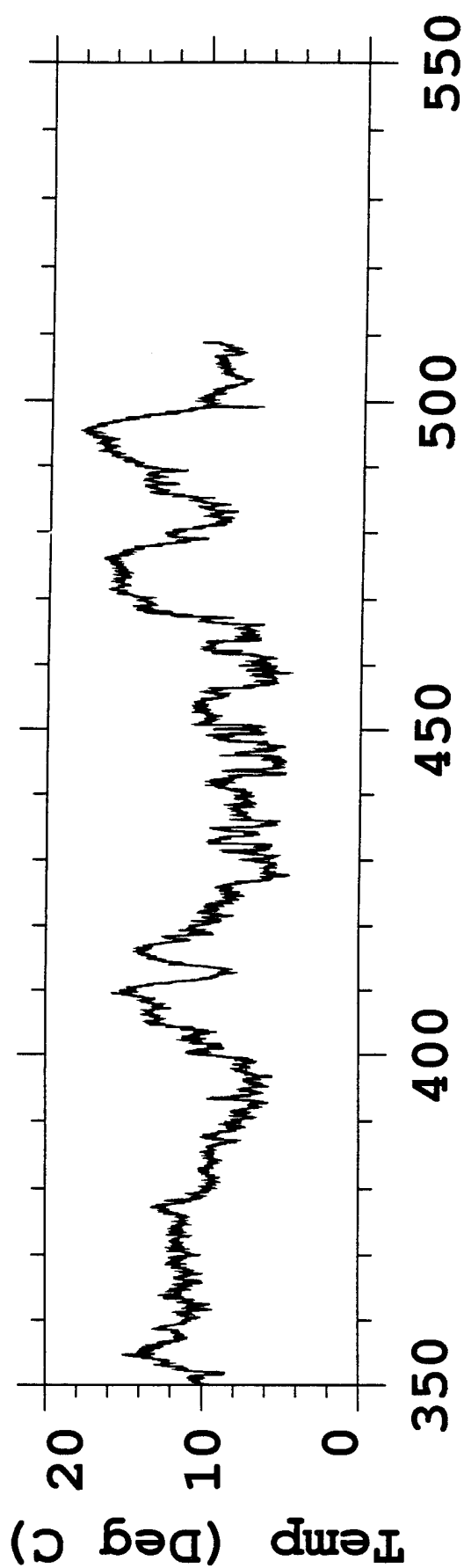
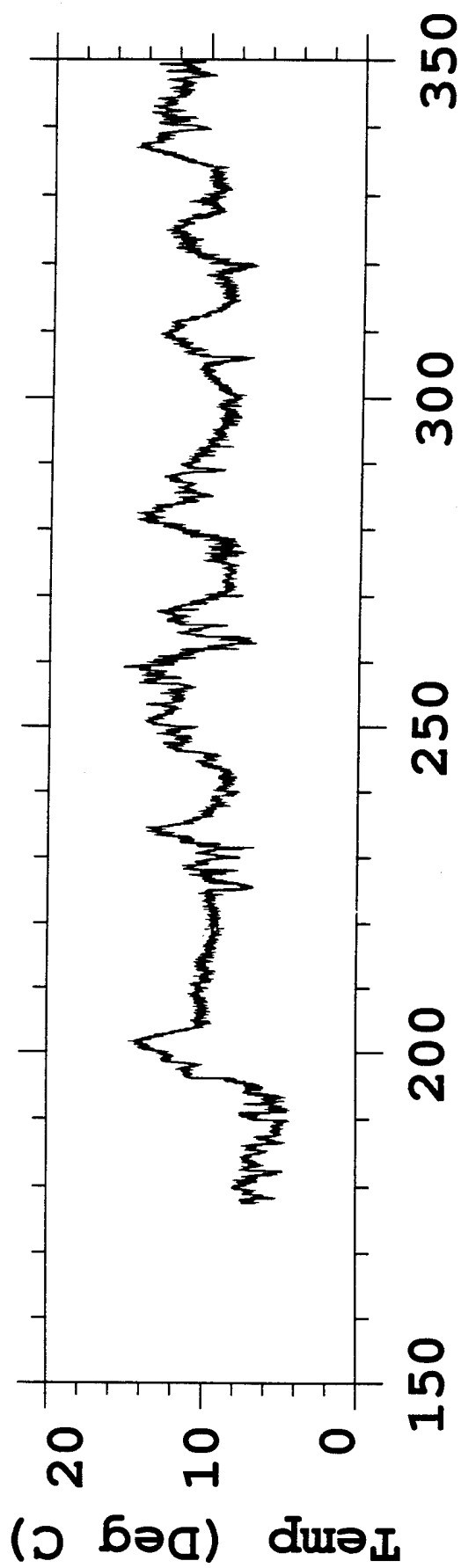
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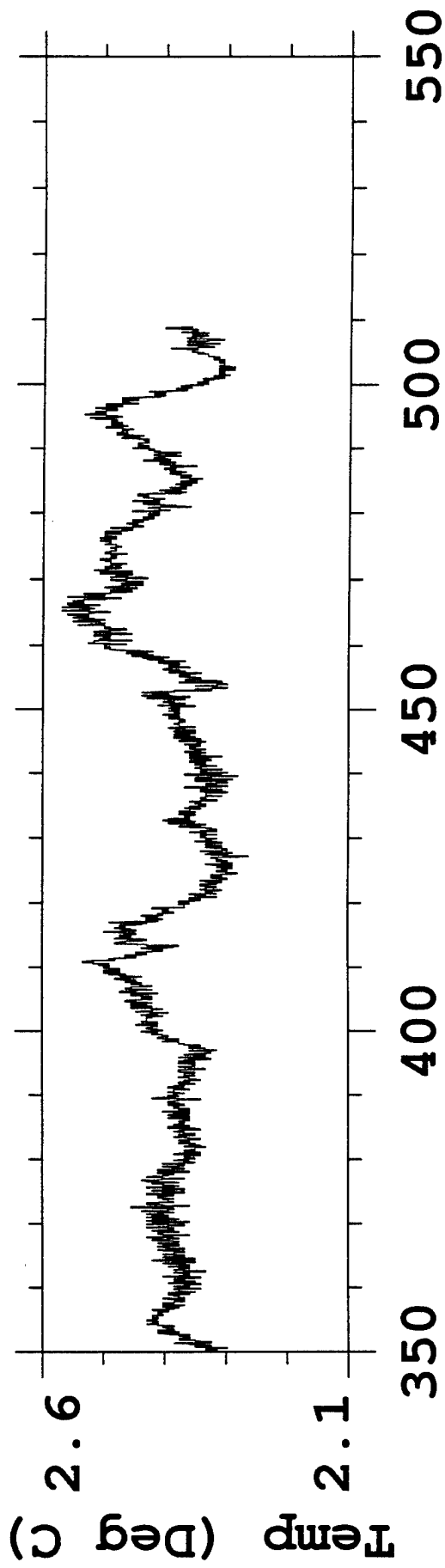
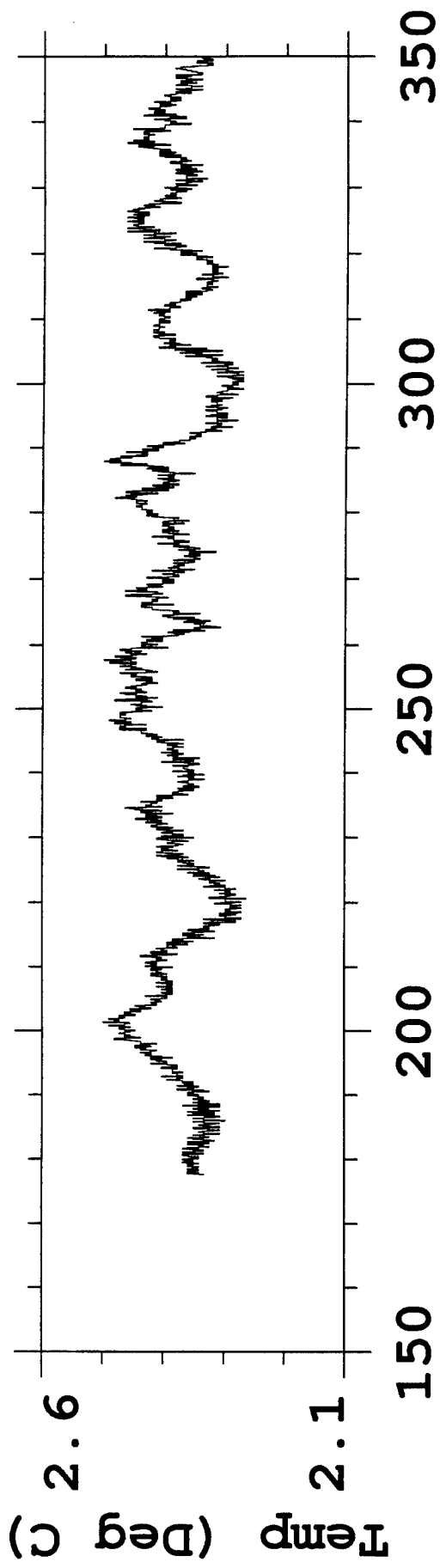
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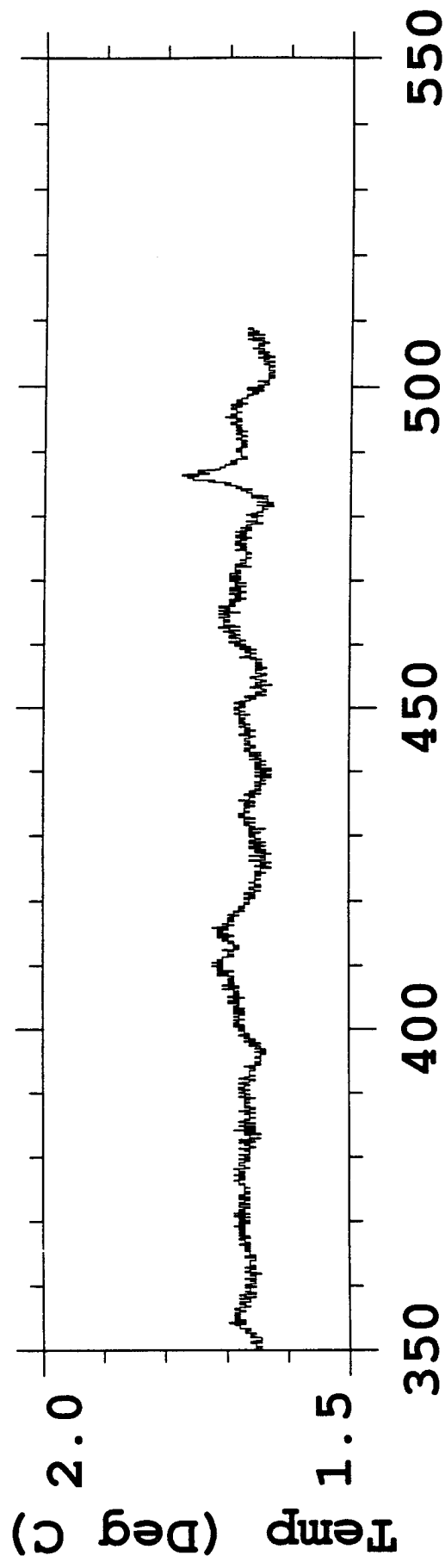
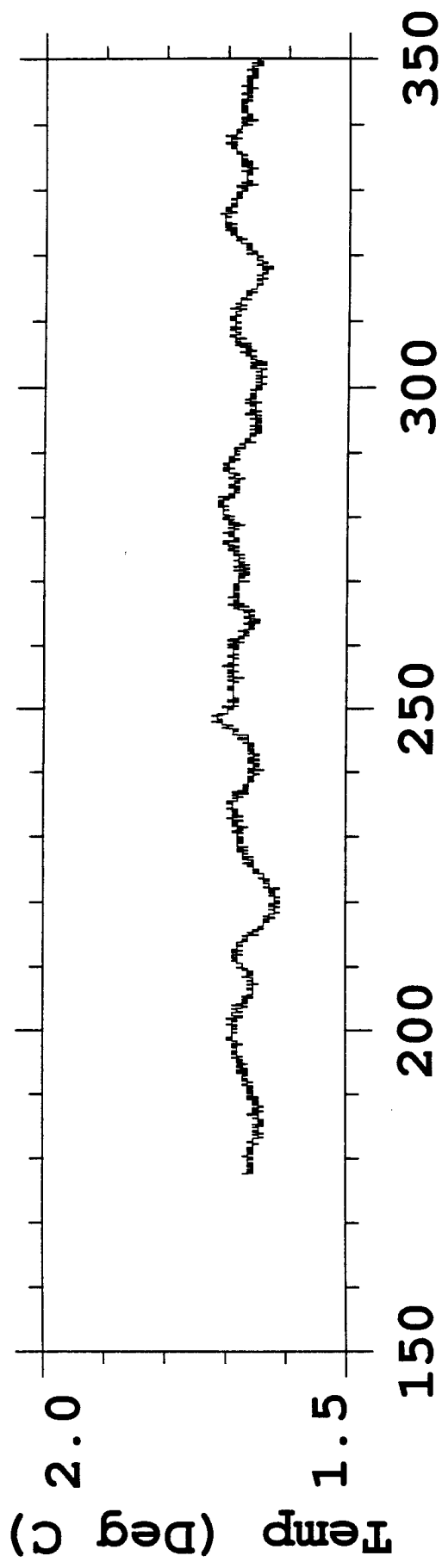
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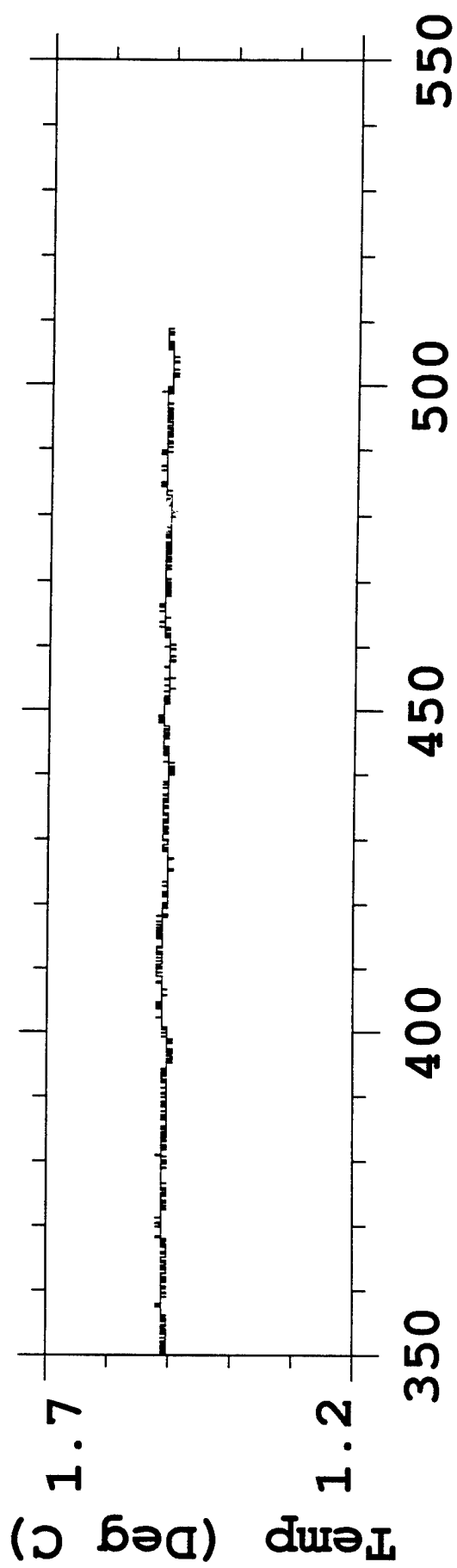
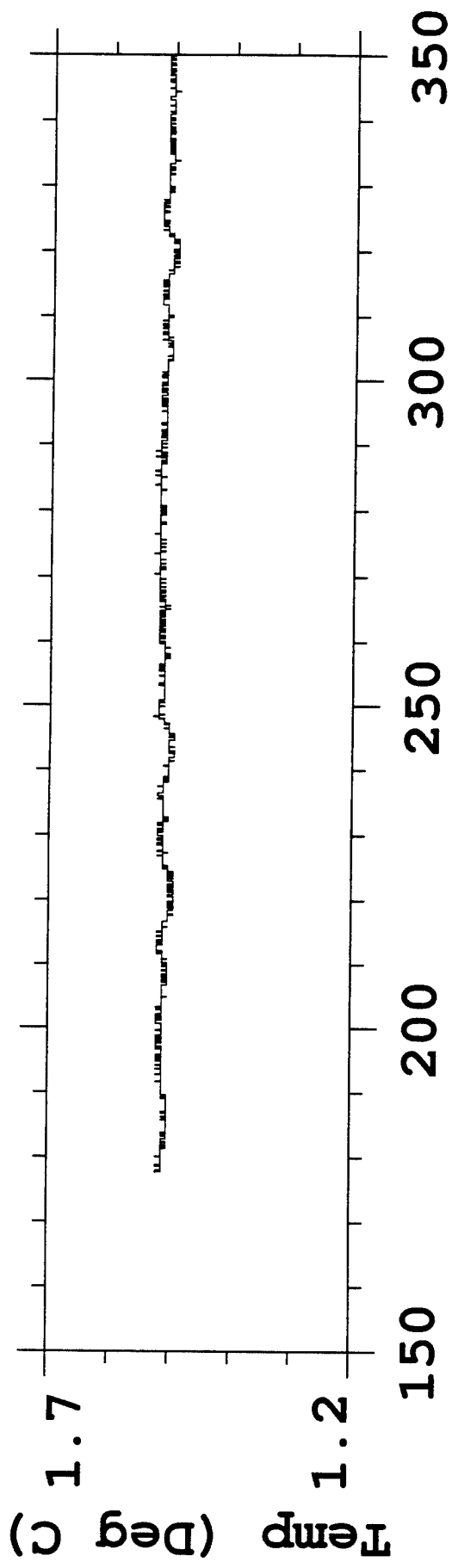
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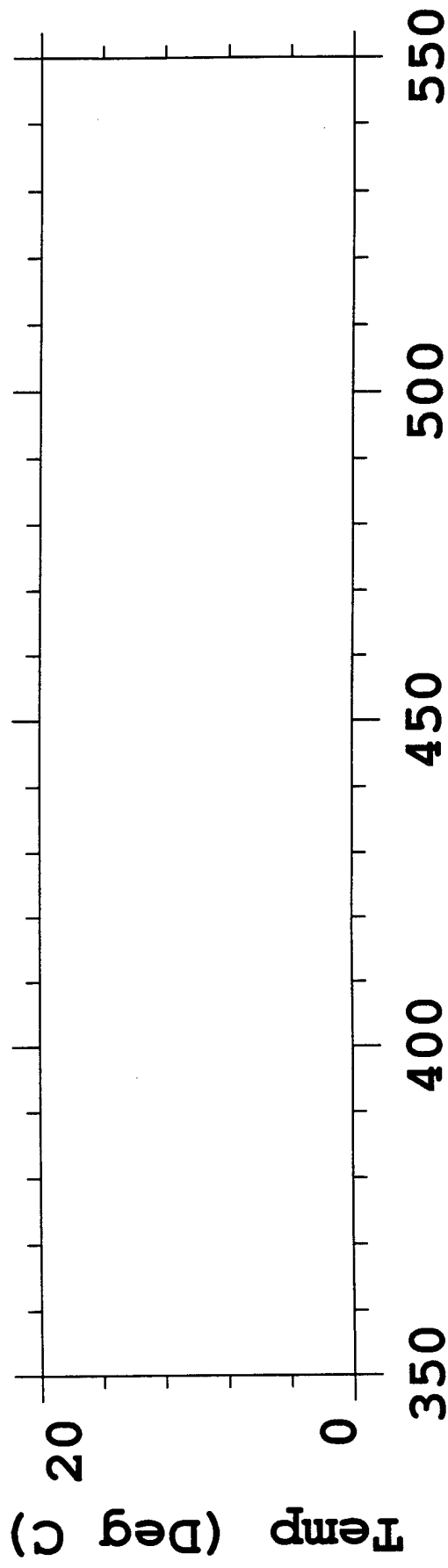
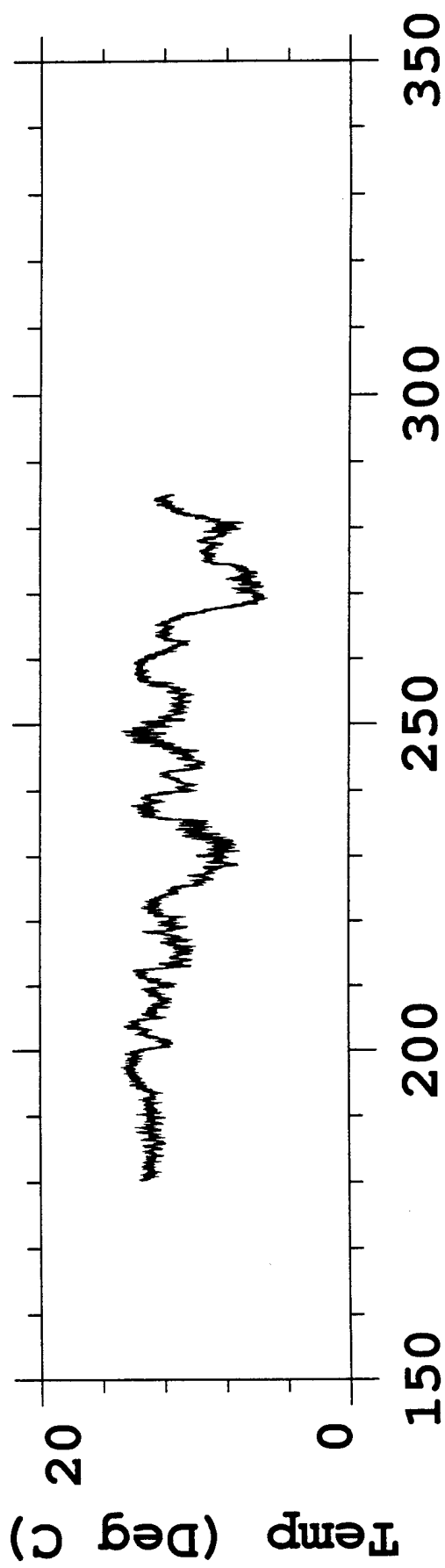
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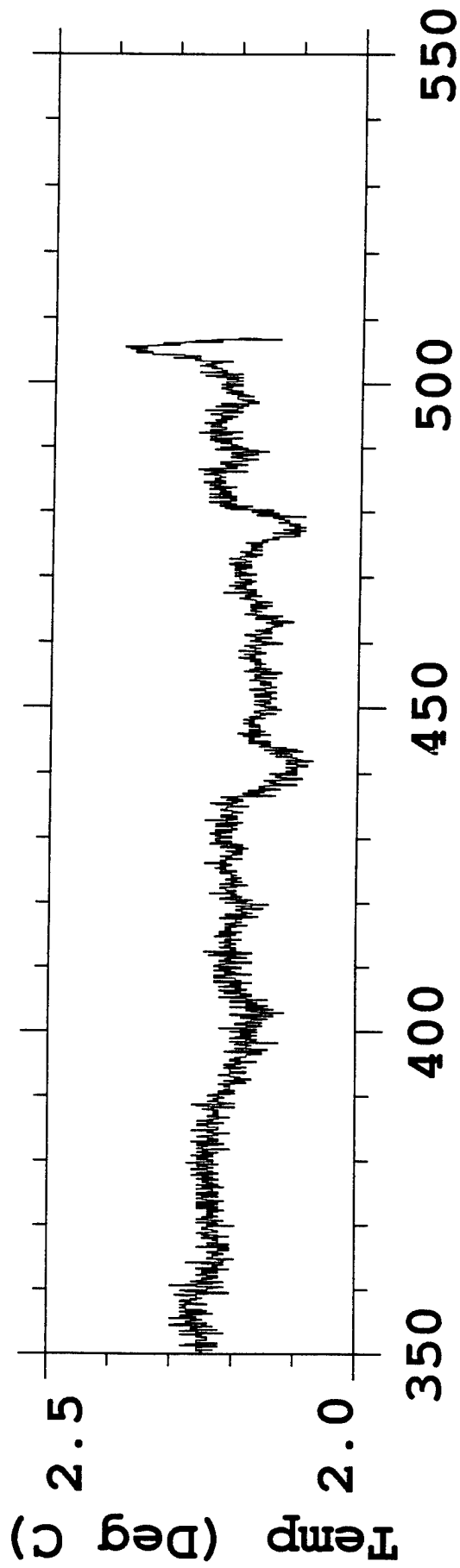
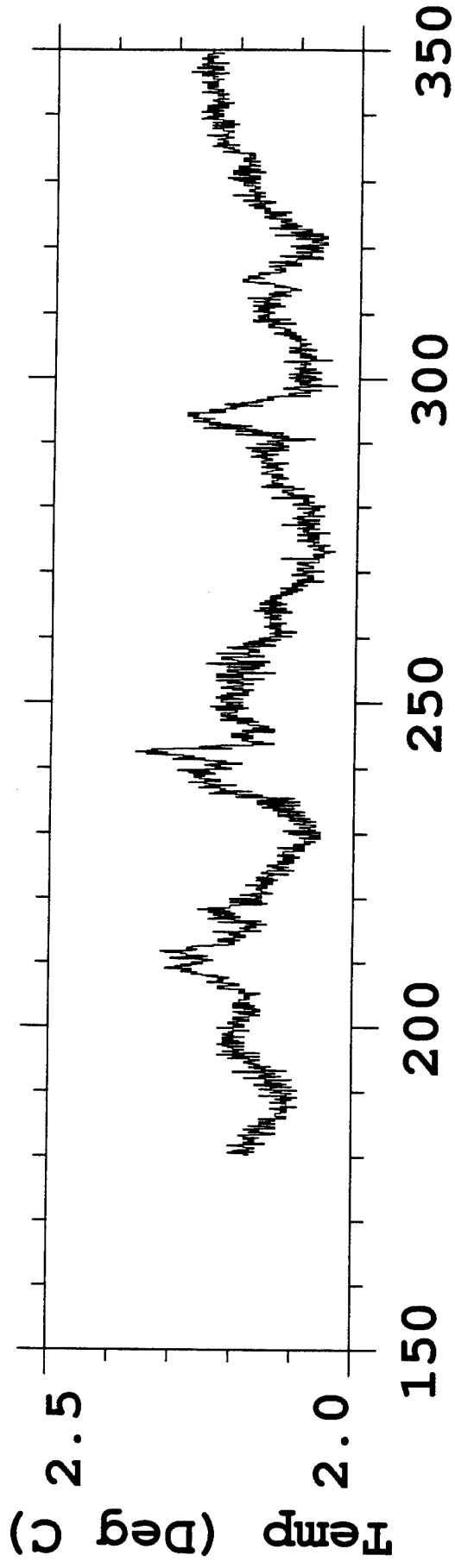
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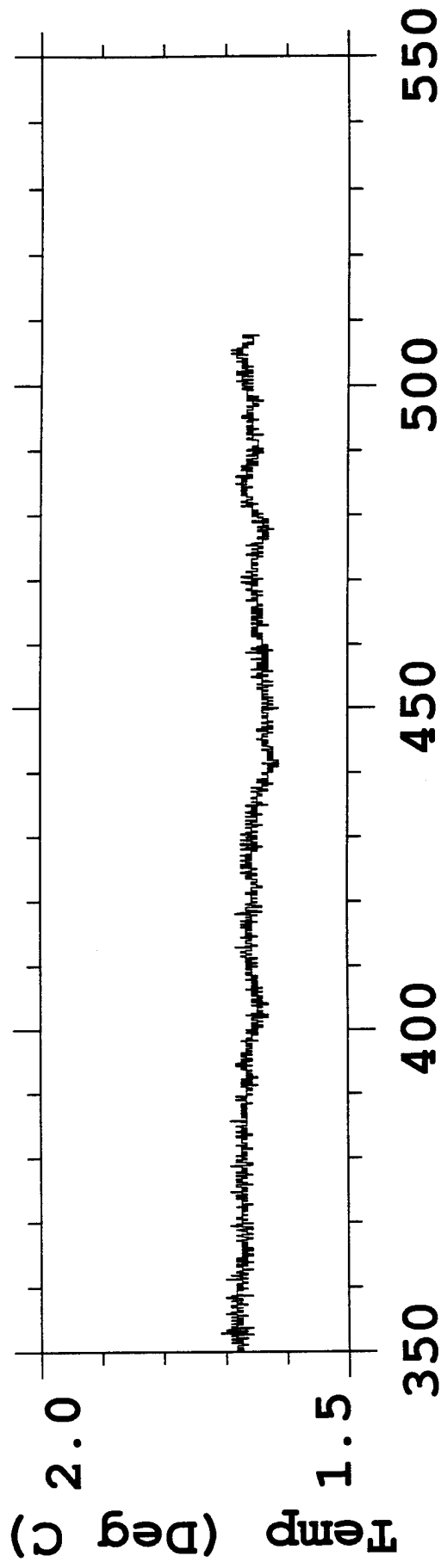
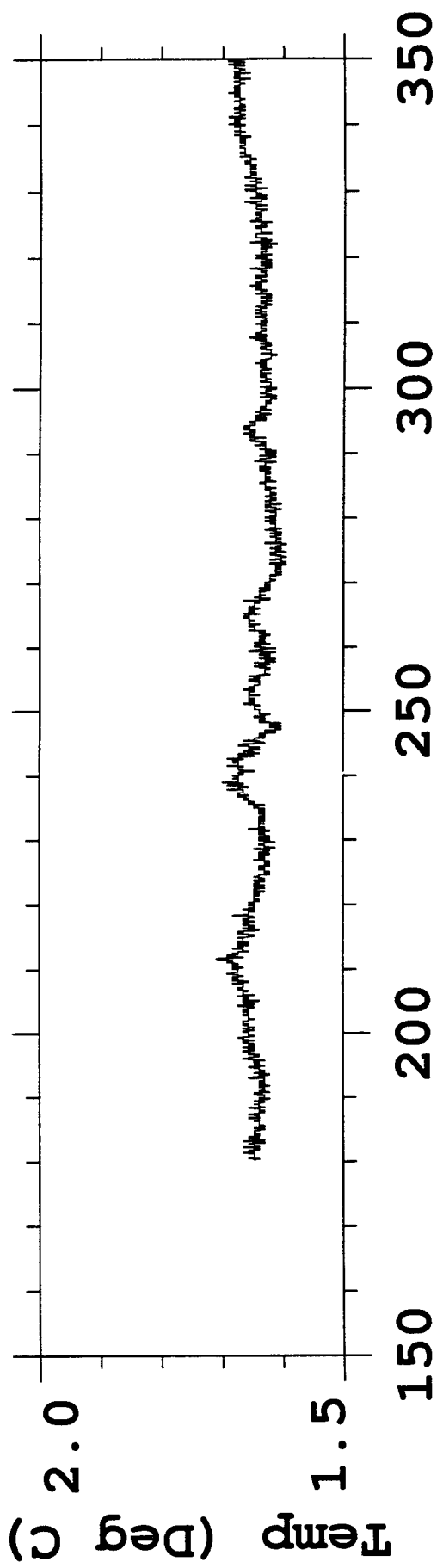
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cm93e2



cm93e3



cm93e4

